BEFORE THE PUBLIC SERVICE COMMISSION
STATE OF MISSOURI

In the Matter of an Investigation Into	)	
An Incident in December 2005 at the	)	
Taum Sauk Pumped Storage Project	)	**Case No. ES-2007-0474**
Owned and Operated by the Union	)	
Electric Company, doing business as	)	
AmerenUE.	)	

STAFF'S INITIAL INCIDENT REPORT

October 24, 2007

KEVIN A. THOMPSON
Missouri Bar No. 36288
General Counsel
Missouri Public Service Commission

STEVEN C. REED
Missouri Bar No. 40616
Chief Litigation Counsel
Missouri Public Service Commission

SHELLEY SYLER BRUEGGEMANN
Missouri Bar No. 52173
Senior Associate General Counsel
Missouri Public Service Commission

BEFORE THE PUBLIC SERVICE COMMISSION
STATE OF MISSOURI

In the Matter of an Investigation Into An Incident in December 2005 at the Taum Sauk Pumped Storage Project Owned and Operated by the Union Electric Company, doing business as AmerenUE.	))))))	**Case No. ES-2007-0474**

STAFF'S INITIAL INCIDENT REPORT

Table of Contents

Appearances

Kevin A. Thompson, General Counsel, **Steven C. Reed,** Chief Litigation Counsel, and **Shelley Syler Brueggemann,** Senior Associate General Counsel, Office of the General Counsel, Missouri Public Service Commission, 200 Madison Street, Post Office Box 360, Jefferson City, Missouri 65102, for the Staff of the Missouri Public Service Commission.

Lewis R. Mills, Jr., Public Counsel, **Christina Baker, P.E.,** Assistant Public Counsel, Office of the Public Counsel, Missouri Department of Economic Development, 200 Madison Street, Suite 650, Post Office Box 2230, Jefferson City, Missouri 65102, for the Public.

Thomas M. Byrne, Managing Associate General Counsel, Ameren Services Corporation, 1901 Chouteau Avenue, MC-1310, St. Louis, Missouri 63103, and

Robert T. Haar, Esq., and **Lisa Pake,** Esq., Haar & Woods, LLP, 1010 Market Street, St. Louis, Missouri 63101, and

Rebecca Wickhem House, Esq., Foley & Lardner, LLP, 777 East Wisconsin Avenue, Milwaukee, Wisconsin 53211, for AmerenUE, and its officers and employees.

Kurt U. Schaefer, Esq., Lathrop & Gage, L.C., 314 East High Street, Jefferson City, MO 65101, and

Kara Valentine, General Counsel, Missouri Department of Natural Resources, Post Office Box 176, Jefferson City, Missouri 65102-0176, for the Missouri Department of Natural Resources.

Sherrie Schroder, Esq., Hammond, Shinners, Turcotte, Larrew & Young, 7730 Carondelet, Suite 200, St. Louis, Missouri 63105, for Mr. Keith Mentel.

Presiding: Colleen M. "Cully" Dale, Chief Regulatory Law Judge and Secretary of the Missouri Public Service Commission.

Contributing Staff

Robert Schallenberg ..... Director, Utility Services Division
Lisa Kremer ..... Manager, Engineering & Management Services Department
Guy Gilbert.....Utility Regulatory Engineer II
Dan Beck .....Supervisor, Engineering Analysis Section
Steve Rackers .....Regulatory Auditor V (St. Louis)
Greg Meyer.....Regulatory Auditor V (St. Louis)

BEFORE THE PUBLIC SERVICE COMMISSION
STATE OF MISSOURI

In the Matter of an Investigation Into An Incident in December 2005 at the Taum Sauk Pumped Storage Project Owned and Operated by the Union Electric Company, doing business as AmerenUE.	))))))	**Case No. ES-2007-0474**

STAFF'S INITIAL INCIDENT REPORT

COMES NOW the Staff of the Missouri Public Service Commission, by and through the Commission's General Counsel, pursuant to §§ 386.071 and 386.390.1, RSMo 2000, and Commission Rule 4 CSR 240-2.070(1), and for its Initial Report, states as follows:

Executive Summary

The Upper Reservoir at the Taum Sauk Pumped Storage Project breached on the early morning of December 14, 2005, because the reservoir overtopped when more water was pumped into the Upper Reservoir than it could hold. The overtopping occurred because (1) the plant was customarily operated with an insufficient margin of safety, (2) the water level sensors were unreliable because they had broken free from their anchoring system, and (3) the emergency back-up sensors, intended to prevent the exact chain of events that in fact occurred, had been improperly set too high. The breach was entirely avoidable in that the Company knew for over two months that the water level sensors were unreliable, as they had broken free from their anchoring system, but unaccountably failed to make repairs. This failure was a management failure in that Ameren had organized the operation of its plants and the performance of

maintenance, repair and improvement activities at its plants in such a way that overall direction was lacking and crucial information was not shared. The investigation and analysis of these matters may well permit Ameren to avoid a similar incident at another of its facilities.

Staff makes the following recommendations:

1. That any and all costs, direct and indirect, associated with the Taum Sauk incident be excluded from rates on an ongoing basis. This includes, but is not limited to, the exclusion of rebuilding costs and treating the facility as though its capacity is available for dispatch modeling.

2. That appropriate accounting treatment be given to the monies expended to rebuild the Taum Sauk plant in order to protect the interests of Missouri ratepayers.

3. That UE shall submit to Staff, on an ongoing basis, its accounting treatment for all transactions relating to the reconstruction of the Taum Sauk plant.

4. That a single, on-site, supervising engineer shall be assigned to oversee all engineering projects at a given UE facility. This supervising engineer shall be responsible and accountable for the satisfactory completion of the work, shall have all necessary authority, including authority to determine when, and whether, the unit may be released for operation, and shall report to an officer of UE.

5. That UE's officers, executives and managers shall work only for UE and shall not simultaneously work for affiliates of UE or for UE's parent.

6. That only UE's officers, executives and managers shall be authorized to make decisions affecting UE's facilities and services.

7. That these internal controls shall be reflected in UE's policies, procedures and job descriptions.

8. That UE shall implement a "whistleblower" program whereby employees may report safety concerns directly to UE's officers without exposure to retaliation. Any such reports shall be immediately communicated to Staff.

9. That UE shall designate an officer or executive as its system-wide safety officer. This officer shall have appropriate duties and authority in order to act effectively to protect UE's assets and system, its employees and customers, as well as the general public, private and public property, from undue risk.

10. That UE shall produce and file, within 90 days hereof, its plan for implementing these recommendations.

Introduction

This report presents the proposed findings of fact, conclusions of law and recommendations developed by the Staff of the Missouri Public Service Commission from the Commission's investigation into the circumstances of the collapse of the Upper Reservoir Dam at the Taum Sauk Pumped Storage Project on the morning of December 14, 2005.

Scope of the Investigation:

Staff moved to open this investigation on June 8, 2007, requesting the Commission to "open an investigatory docket in order to determine whether UE's electric plant and operational practices are safe and adequate and, after due

consideration of the competent and substantial evidence of record therein, make such order or orders as will best protect the public interest, whether to direct the General Counsel to file a complaint before the Commission or elsewhere, or to refer the matter to another agency or agencies, or to make some other appropriate disposition thereof." The Commission granted Staff's motion over AmerenUE's objection on June 19, 2007, stating: "The Commission has reviewed Staff's request and AmerenUE's response and, finding it reasonable to open this investigation, will do so for the purpose of receiving an Incident Report. Staff's request to open a contested case docket will be denied." The Commission directed its Staff to file a report not "later than 120 days from the date of this order," that is, by October 17, 2007.

Proceedings:

The Commission convened an evidentiary hearing on July 24, 2007, which continued on July 25, August 1, 2, 3, 13, 14, 16, and 17. The Commission heard the testimony of 13 witnesses and received 60 exhibits, as follows:

Witnesses:

1. James Alexander,	Chief Engineer, Dam Safety Program, Missouri Department of Natural Resources, Rolla, Missouri. Tr. 1:17-111.
2. Anthony Zamberlan	Electrical Engineer; Partner, Laramore, Douglass & Popham Consulting Engineers, Chesterfield, Missouri. Tr. 1:111-210 ; Tr. 2:215-288.
3. Steven Bluemner	Project Engineer, Ameren Services Tr. 2:288-419.
4. Thomas Pierie	Project Engineer, Ameren Services

		Tr. 3:424-800; Tr. 4 HC.
5.	David Fitzgerald	Current and former Manager, Taum Sauk Pumped Storage Project, AmerenUE. Tr. 5:812-1039.
6.	Warren Witt	Manager of Hydro Operations, AmerenUE Tr. 5:1039-1210, Tr. 6 HC.
7.	Steve Schoolcraft	Generation Coordinator, Ameren Energy Tr. 7:1215-1405, Tr. 8 HC.
8.	Mark Birk	Vice President of Power Operations, AmerenUE Tr. 7:1406-1620, Tr. 8 HC.
9.	James E. Bolding	Power Dispatcher, Ameren Energy Tr. 9:1635-1763.
10.	Keith Mentel	Hydro Plant Technician, AmerenUE (retired). Tr. 9:1764-1898.
11.	Jeffrey Scott	Supervisor, Power Production & Engineering, Taum Sauk Plant, AmerenUE Tr. 10:1905-2144.
12.	Thomas Voss	President and CEO, AmerenUE. Tr. 11:2151-2410; Tr. 12 HC.
13.	Shawn E. Schukar	Vice President, Ameren Energy Tr. 13:2416-2557.

Exhibits:[1]

1. Power Point Presentation by James Alexander, MoDNR.
2. Missouri State Highway Patrol ("MSHP") Interview of James Alexander, MoDNR.

[1] In this report in an uncontested case, Staff also relied upon information found on Ameren's website and on portions of the Missouri State Highway Patrol (MSHP) Investigation Report that were not introduced into evidence.

3. FERC Report: "Taum Sauk Reservoir Dam Breach No. P-2277, Technical Reasons for the Breach of December 14, 2005, by FERC Panel of Independent Consultants, dated May 24, 2006 ("IPOC Report"):
   CONTENTS:
   1. Introduction
   2. Project Description
   3. Design, Construction History and Performance
   4. Standard Operating Procedure
   5. Overpumping Protective Systems
   6. December 14, 2005 Breach
   7. Technical Cause of Breach
   8. Conclusions
   Appendix A - IPOC Information Request Letter
   Appendix B - Event Chronology
   Appendix C - Early Project Correspondence (4.9 MB)
   Figures
4. Drawing – Upper Warrick Probes, "as found."
5. MSHP Interview of Anthony Zamberlan, January 23, 2006
6. MSHP Interview of Anthony Zamberlan, December 7, 2006
7. E-mail, December 2, 2004, from Zamberlan to Pierie.
8. Report of Forensic Investigation and Root Cause Analysis, December 14, 2005 Incident, Upper Reservoir Dike, Taum Sauk Plant, FERC Project No. 2277, by Pail C. Rizzo Associates, Inc., for AmerenUE, submitted to FERC, April 7, 2006 ("Rizzo Report"):
   CONTENTS:
   1.0 Introduction
   2.0 Summary Description of the Taum Sauk Plant
   3.0 Summary Description of the Site Geology
   4.0 Description of the December 14, 2005 Incident
   5.0 Overall Approach to Root Cause Analysis
   6.0 Definition of the Upper Reservoir Barriers
   7.0 Site Investigation of Upper Reservoir Barriers
   8.0 Analysis of Upper Reservoir Barriers
   9.0 Operation and Control at Taum Sauk
   10.0 Summary Results of Barrier Analysis
   11.0 Conclusions and Acknowledgements
   References and Plates
   Appendix A - Siemens Report March 24, 2006, AmerenUE
   Appendix B - May 15, 1964 "Pickel Report"
   Appendix C - Gouhou Dam Paper
   Appendix D - Boring Logs
   Appendix E - Laboratory Test Data
   Appendix F - Calculations
   Appendix G - Instrument and Support Drawings

9. Letter dated May 23, 2006, to MSHP from Mark Birk, AmerenUE, containing AmerenUE's responses to MSHP's requests for information.
10. Letters to FERC from Cooper & Bluemner, certifying that liner project was successfully completed.
11. E-mails.
12. Drawing by Bluemner.
13. MSHP Interview of Thomas C. Pierie, January 9, 2006.
14. MSHP Interview of Thomas C. Pierie, March 1, 2007.
15. Schematic of Instrument Cabinet.
16. E-mail from Pierie to Jeff Scott, sent September 28, 2005.
17. E-mails, sent October 7, 2005, and October 10, 2005.
18. E-mails, sent October 7, 2005, October 10, 2005, and October 11, 2005.
19. E-mails, sent November 30, 2004.
20. E-mail, sent September 27, 2005.
21. Drawing by Pierie on the Smart Board.
22. Report of Findings on the Overtopping and Embankment Breach of the Upper Dam -- Taum Sauk Pumped Storage Project, FERC No. 2277 (FERC Staff Report), April 28, 2006.
    CONTENTS:
    Executive Summary
    Section 1--Project Description
    Section 2--Project History
    Section 3--Historical Performance of Upper Reservoir
    Section 4--Post Breach Survey and Estimates of Overtopping
    Section 5--Instrumentation and Controls
    Section 6--Taum Sauk Upper Reservoir Breach Time Line
    Section 7--Meteorology
    Section 8--Hydrology and Hydraulics
    Section 9--Stability Analysis
    Section 10--Emergency Response
    Section 11--Environmental Effects Associated with the Breach of the Upper Reservoir at the Taum Sauk Project
    Bibliography
    Appendix A
    Appendix B - Section 4 - Reservoir Levels, Pumping Intervals Analysis Charts
    Appendix C - Section 7 - Weather Data
    Appendix D - Section 8 - Embankment Stability
    Appendix E - Section 10 - List of Soils in the Impact Zone of Upper Reservoir Breach
23. MSHP Interview of David T. Fitzgerald, December 19, 2005.
24. E-mail, sent December 23, 2002.

25. E-mail, sent May 20, 2000.
26. Taum Sauk Call-Out and Taum Sauk Facts.
27. MSHP Interview of Warren A. Witt, March 17, 2006.
28. MSHP Report of Field Investigation at Taum Sauk, March 10, 2006.
29. MSHP Interview of Warren A. Witt, April 4, 2007.
30. E-mails sent November 4, 2005, and November 7, 2005, concerning the removal of Tom Pierie from the Taum Sauk controls project.
30-A. E-mails sent November 4, 2005, November 7, 2005, and November 9, 2005, concerning the removal of Tom Pierie from the Taum Sauk controls project.
31. E-mail, sent by Rick Cooper on October 9, 2005.
32. E-mail, sent by Rick Cooper on November 15, 2005.
33. MSHP Interview of Steven J. Schoolcraft, February 16, 2007.
34. Diagram.
35. E-mail, sent September 9, 2005.
36. E-mails, sent November 14, 2005, November 23, 2005, December 5, 2005, and December 8, 2005.
37. E-mails, sent November 9, 2005, and November 10, 2005.
38. Chart—Day Ahead Markets, December 13-15, 2005.
39. Chart—Day Ahead Markets, April 30, 2005, and July 28, 2005.
40. MSHP Interview with Mark C. Birk, February 16, 2007.
41. E-mails, sent December 1, 2005, December 2, 2005, and December 6, 2005.
42. UE's Second Supplemental Incident Report to the FERC, January 27, 2006.
43-P. E-mails, sent September 29, 2005, and September 30, 2005, concerning budget reductions at Ameren.
44. E-mails, sent November 10, 2004, including Birk's message concerning his expectations of the plant operating groups.
45. MSHP Interview of James E. Bolding, January 9, 2006.
46. MSHP Interview of James E. Bolding, January 19, 2006.
47-P. Taum Sauk Operation Manual.
48. MSHP Interview of Keith L. Mentel, January 13, 2006.
49. E-mail, sent December 9, 2005, by Jeff Scott.
50. MSHP Interview of Jeff Scott, December 20, 2005.
51. MSHP Interview of Jeff Scott, April 4, 2007.
52. Photograph.
53. List of Errors in Judgment, prepared by Thomas Voss at the request of the Public Counsel, filed September 12, 2007.
54. Realtime Market LMPs from the MISO website, November 19, 2005.

55. Realtime Market LMPs from the MISO website, November 20, 2005.
56. Clearing Prices for Hours in the Day-Ahead Market.
57. MISO Document, dated November 19, 2005.
58. MISO Document.
59. MISO Document.
60. Document entitled, "AmerenUE Operational Responsibility."

UE also supplied certain requested information after the close of the hearing.

Proposed Findings of Fact

Based on the evidence adduced, Staff recommends that the Commission make the following findings of fact:

The Parties:

1. Union Electric Company, which does business as AmerenUE ("UE"), is a traditional, vertically-integrated electric and natural gas utility that serves some 1.2 million electric customers and 125,000 natural gas customers in the state of Missouri. *Ameren website.* UE is the largest electric utility in Missouri. *Ameren website; Testimony of Warren Wood, P.E., December 27, 2006,* Case No. EO-2007-0037, Tr. 7: 21-22.

2. The Missouri Public Service Commission ("PSC") is charged with the regulation of investor-owned public utilities and is authorized to investigate and inquire concerning the safety and adequacy of utility operations, practices, installations, and facilities, and to receive information from public utilities under its jurisdiction pursuant to §§ 386.250, 386.310, and 393.140, (1)-(3), (5), (9) and (10), RSMo. 2000, and § 393.130.1, RSMo Supp. 2006. The PSC is authorized to direct public utilities to improve their facilities and to change their practices as

necessary to enhance the safety and adequacy of their facilities, practices and services.

3. The Public Counsel is appointed by the Director of the Missouri Department of Economic Development and is authorized under §§ 386.700 and 386.710, RSMo 2000, to "represent and protect the interests of the public in any proceeding before or appeal from the public service commission[.]"

4. The Missouri Department of Natural Resources ("DNR") is the State agency responsible for the administration of Johnson's Shut-ins State Park under Chapter 640, RSMo.

Ameren and AmerenUE:

5. UE is wholly-owned by Ameren, a publicly-traded utility holding company which also owns three other operating electric utilities in the state of Illinois,[2] as well as other subsidiaries engaged in the generation of electricity and other activities. *Ameren Corporate Facts, Ameren website.*

6. Ameren, headquartered in St. Louis, Missouri, is a public utility holding company under PUHCA 2005 administered by the Federal Energy Regulatory Commission ("FERC").[3] Ameren was registered with the Securities and Exchange Commission ("SEC") as a public utility holding company under PUHCA 1935 until that act was repealed effective February 8, 2006. Ameren was formed in 1997 by the merger of UE and CIPSCO, the former parent company of CIPS. Ameren acquired CILCORP in 2003 and IP in 2004. Ameren's primary assets are the common stock of its subsidiaries, including UE, CIPS, Genco, CILCORP

[2] AmerenCILCORP, AmerenCIPS and AmerenIP.

[3] "PUHCA" is the Public Utility Holding Company Act.

and IP. Ameren's subsidiaries, which are separate, independent legal entities, operate rate-regulated electric generation, transmission and distribution businesses, rate-regulated natural gas transmission and distribution businesses, and non-rate-regulated electric generation businesses in Missouri and Illinois. Dividends on Ameren's common stock depend upon distributions made to it by its subsidiaries. *Ameren's Form 10-K, for the fiscal year ended December 31, 2006, SEC website,* p. 4*.*

7. During 2006, the Ameren Companies' peak demand from retail and wholesale customers was 17,703 megawatts. The combined peak capability to deliver power from owned generation and power supply agreements was 20,899 megawatts. Ameren-owned generation and purchased power currently meet the energy needs of UE, Genco, AERG, and Marketing Company customers, with the required reserve margins. Power for the Ameren Illinois Utilities is purchased through an ICC-approved auction that was first held in September 2006. Factors that could cause UE to purchase power include, among other things, absence of sufficient owned generation, plant outages, the failure of suppliers to meet their power supply obligations, extreme weather conditions, and the availability of power at a cost lower than the cost of generating it. *Ameren's Form 10-K, for the fiscal year ended December 31, 2006, SEC website,* p. 7*.*

8. UE's electric supply is obtained primarily from its own generation. In March 2006, UE completed the purchase of three CT facilities, totaling 1,490 megawatts of capacity at a price of $292 million. These purchases were

designed to help meet UE's increased generating capacity needs and to provide UE with additional flexibility in determining when to add future baseload generating capacity. UE expects the addition of these CT facilities to satisfy demand growth until about 2018. In the meantime, UE will be evaluating baseload electric generating plant options, including coal-fired, nuclear, pumped-storage and integrated gasification combined cycle coal technology. *Ameren's Form 10-K, for the fiscal year ended December 31, 2006, SEC website,* p. 8*.*

The Taum Sauk Incident:

9. On December 14, 2005, at approximately 5:20 A.M. CST, the northwest corner of the Taum Sauk Upper Reservoir ("UR") dike failed, resulting in a release of the water contained in the upper reservoir. The reservoir drained in about 25 to 30 minutes. *Ex. 22:7.* Approximately 4,300 acre-feet of storage – 1.3 billion gallons of water -- was released. *Ex. 22:7.* The peak discharge from the breach was about 273,000 cubic feet per second ("cfs"), which occurred within 10 minutes of the initial breach. *Ex. 22:7.*

10. The breach resulted from overtopping of the reservoir that occurred during the final minutes of the pumping cycle on the morning of December 14, 2005. *Ex. 22:7.* The pumping cycle ended at 5:15 A.M. CST, and the initial breach formed at about the same time. *Ex. 22:7.* Once overtopping began, erosion started at the downstream toe of the 10-foot-high parapet wall. *Ex. 22:7.* Erosion progressed below the parapet wall and probably caused one or more of the parapet wall sections to collapse. *Ex. 22:7.*

11. The breach flow passed into the East Fork of the Black River (the river

upstream of the lower Taum Sauk dam) through Johnson's Shut-Ins State Park and then into the lower reservoir. The lower Taum Sauk dam was not damaged. Below the lower Taum Sauk dam, the high flows proceeded down the Black River to the town of Lesterville, Missouri. The incremental rise in the river level was about 2 feet, which remained within the banks of the river. *FERC Staff Report,* p. 7.

12. The damage to the Johnson's Shut-Ins State Park, operated by the Missouri Department of Natural Resources ("DNR"), was extensive. The breach flows destroyed the home of the Johnson's Shut-Ins State Park superintendent, flooded motorists on Highway N, and significantly damaged the park, campground, and adjacent properties. The park superintendent's children were hospitalized following the breach. In addition to destroying the superintendent's house, the flood damaged the park water system and the boardwalk to the shut-ins. Trees stripped from the hillside were piled 15-feet high and sand and clay up to eight feet deep covered much of the area. The breach waters scoured a hole at the base of the mountain and a six-acre lake was created by displaced boulders that dammed the East Fork. 15,000 truckloads of debris were removed from the park. Redevelopment of the park is expected to be complete in 2008. *Division of State Parks 2006 Year-End Summary, DNR website.*

The Taum Sauk Pumped Storage Project:

13. Among UE's activities is the operation of at least 15 major electric generating stations,[4] one of which is the Taum Sauk Pumped Storage Project

[4] Including the Labadie, Meramec, Rush Island, and Sioux base-load, coal-fired plants, the Callaway Nuclear Plant, the oil or natural gas combustion turbine plants at Audrain, Goose Creek,

("Taum Sauk"), located in Reynolds County, Missouri, on the East Fork of the Black River, approximately 90 miles southwest of St. Louis, Missouri. *Ex. 3:7.* Taum Sauk was the first of the large capacity pumped-storage stations to begin operation in the United States, beginning commercial operations in December, 1963. *Ex. 3:7.* The project license was issued on August 26, 1965. *Ex. 3:8.*

14. Taum Sauk is a reversible pumped storage project used to supplement the generation and transmission facilities of UE, and consists basically of a mountain ridge top Upper Reservoir ("UR"), a shaft and tunnel conduit, a 450-MW, two-unit pump turbine, motor-generator plant, and a lower reservoir. *Ex. 3:7; Ex. 8:2.* The operating head ranges between 776 ft. to 860 ft. *Ex. 3:7.* In 2005, the Taum Sauk facility provided 589,000 megawatthours of electricity. *Ameren's Form 10-K, for the fiscal year ended December 31, 2006, SEC website,* p. 19.

15. The Plant Superintendent at Taum Sauk, Richard Cooper, had primary responsibility both for operations and dam safety. *Ex. 8:124.* Daily and weekly inspections were carried out by technicians under Cooper's direction. *Ex. 8:125.*

The Upper Reservoir:

16. Both the upper reservoir and the lower reservoir at Taum Sauk are created by dams, also called dikes.

17. The floor of the UR was sealed with 2-inch layers of hot-mix asphaltic concrete placed over leveled and compacted quarry muck. *Ex. 8:4.* A low area

---

Kinmundy, Peno Creek, Pinckneyville, Raccoon Creek, and Venice, and the hydroelectric plants at Keokuk, Lake of the Ozarks, and Taum Sauk. The net generating capacity of the Ameren companies, including Ameren's 80% share of the EEI plant at Joppa, Illinois, exceeds 16,200 megawatts. *Ameren Corporate Facts, Ameren website.*

in the floor of the UR, called the “fish pond,” was located by Panels 90-102. *Ex. 3:20.* A concrete-lined access tunnel through the UR dike permits access to the UR floor. *Ex. 8:4.*

18. The dike that impounded the UR at Taum Sauk was 6,562-feet long and formed a kidney-shaped reservoir. *Ex. 3:7; Ex. 8:3.* The UR dike was a steep, concrete-faced, dumped rock fill dam that rose about 84 feet above the floor of the UR at elevation 1505. *Ex. 3:7, 11; Ex. 8:3.* The upstream slope was 1.3:1 (horizontal:vertical) and the downstream slope was at the natural angle of repose of the material, approximately 1.3:1. *Ex. 3:9.* The summit of the dike was 12-feet wide and was located at elevation 1589. *Ex. 8:3.* The dike was topped with a 12-foot layer of horizontally-compacted rock placed in 4-foot lifts and compacted with a vibratory roller. *Ex. 3:10.* A 10-feet high, 1-foot thick, reinforced concrete parapet wall was cast in place on the summit of the dike. *Ex. 3:10; Ex. 8:3.* The UR dike had no spillway. *Ex. 3:7, 28; Ex. 8:4.*

19. The UR dike functioned successfully for 42 years. *Ex. 3:11.* However, the FERC Independent Panel of Consultants considered it “likely “ that the UR dike had “no margin for additional loading or overtopping.” *Ex. 3:11.*

20. The design elevation of the top of the UR parapet wall was 1599. *Ex. 8:3.* However, settling of the structure over the years had lowered the top of the parapet wall in some places by as much as two feet. *Ex. 8:116.* Such settling is common with earth and rock fill dams. *Ex. 8:116.* The lowest point was elevation 1596.99 at Panel 72, as determined by Steve Bluemner’s survey on November 6, 2004. *Ex. 3:10; Tr. 2:292.* Bluemner also surveyed the height of

the top of the wall at the gauge piping at elevation 1597.92 feet above sea level. *Tr. 2:293.* Bluemner provided the elevations to Tom Pierie and to no one else. *Tr. 2:294.*

Operations at Taum Sauk:

21. The Taum Sauk project is a peaking and emergency reserve facility. *Ex. 3:13.* A typical daily cycle in the summer is to generate in the morning by releasing water from the upper reservoir through the pump/turbines to the lower reservoir, pump from the lower reservoir to the upper reservoir in the afternoon, generate in the evening and pump from the lower reservoir to the upper reservoir in the early morning. *Ex. 3:13.* Generation and pump-start and duration is determined by system needs. *Ex. 3:13.* In the fall, winter, and spring, the number of cycles is typically less, usually pumping at night and generating during the day. *Ex. 3:13.* At times, during periods of low demand, the facility is not operated. *Ex. 3:13.*

22. The Taum Sauk plant had two primary modes of operation called (1) efficiency mode and (2) load set. The objective of operating in efficiency mode was to produce the maximum amount of megawatt hours, up to approximately seven hours. When "both units [were] on generating maximum… as the head pressure decreased (or as the level decreased in the Upper Reservoir)… we would open up the throttles to maintain a megawatt load [sic]." Tr. 5: 954. Then, at a certain point, "the computer system automatically reduced the megawatt output to maximize total generation." Tr. 5: 955.

23. While the objective of operating in load set "was to target a particular

level of megawatts… [by adjusting] the wicket gates, which are controlling mechanisms, to allow water to enter the turbine…to maintain a specific load" for up to five hours. Tr. 5:952, 954.

24. The range of energy output per unit was approximately 234 megawatts, with a minimum load setting at approximately 150 megawatts. Therefore, the overall range when running both units was 300 megawatts to a maximum output of 468 megawatts. Tr. 5: 952-956. "Any combination of one or two units… [could be used to] select any [single unit] megawatt setting from… 150 to 234." Tr. 5:954.

25. The Taum Sauk generating plant is owned by AmerenUE but its pump-back and generation of electricity is dictated by a separate company called Ameren Energy, Inc.. Ameren Energy, Inc., is a power marketing and risk management agent for AmerenUE. Both are subsidiaries of Ameren Corporation. *Ameren Website.* In turn, Ameren Energy is told by the Midwest Independent Transmission System Operator (MISO) when generating assets such as Taum Sauk should expect to run.

26. MISO is a non-profit regional transmission organization that schedules member utilities, such as AmerenUE, to generate electricity on the most cost-effective basis to serve native load and make off-system sales when economical. The total power that Taum Sauk could generate was offered into MISO on a day-ahead basis based upon what market rates were anticipated the next day. Ameren Energy would place the offer into MISO and receive an award from MISO indicating when to generate and at what level of power. *Tr. 13:2421-2422.*

27. AmerenUE generation from plants such as Taum Sauk was offered into MISO by 11:00 a.m. on a day- ahead basis, committing Taum Sauk to generate the next day at times and power levels within its capacity. *Tr. 7:1521.* If Ameren did not meet its commitment, it would have to make up the lost megawatts by buying them from MISO and UE would thereby incur revenue insufficiencies and certain charges. *Tr. 7:1521, 1523.*

28. Pump back was generally done at night, when the price curve fell enough to make running the pumps more economical. *Tr. 7:1230-1231.* Although it takes more power to fill the reservoir than it generates, it is still profitable to operate because of the difference in market prices for energy at the times of pump-back and generation. Tr. 7:1236.

Operations at Taum Sauk—Remote Operation:

29. Taum Sauk was operated remotely through a microwave system from AmerenUE's Osage Plant at the Lake of the Ozarks, under the direction of the load dispatcher in St. Louis. *Ex. 3:13; Ex. 8:114; Ex. 23:1.* St. Louis control center staff provided generate mode and pump mode start, stop and generating Megawatt (MW) instructions to operators at the Osage control center at Bagnell Dam. *Ex. 3:8.* In the pumping mode, input MW and pump cfs (cubic feet per second) discharge depend on the head (elevation difference between the upper and lower reservoirs) and are not adjustable. The Osage operators remotely start, stop and load the Taum Sauk units as instructed. *Ex. 23:1.* Protection circuits are provided at Taum Sauk to prevent operating the units or reservoirs beyond established limits.

30. The operators at Bagnell Dam and in St. Louis had both digital and graphical displays of water level versus time. *Ex. 3:25.* One operator, when interviewed by FERC, admitted to seeing anomalous water level data displayed "maybe once or twice." *Ex. 3:25.*

Operations at Taum Sauk—Operating Level:

31. Normal operations at Taum Sauk included storing water against the UR parapet wall, a practice termed "unprecedented" by FERC's independent panel of consultants and one that increased the number of potential modes of failure and made failure of the UR more likely. *Ex. 3:10, 11, 30; Tr. 1:89-90, 91, 92.*

32. The UR was designed to be operated with two feet of freeboard, that is, at a maximum elevation of 1597. *Ex. 8:116.* The probability of overtopping was high at Taum Sauk because the operating level of 1596 was too close to the low point of the top of the parapet wall at elevation 1596.99 at Panel 72. *Ex. 3:31.*

33. The UR was operated at a higher elevation in the summer than in the winter:

UPPER RESERVOIR ELEVATIONS *Prior to the 2004 outage*		
	Summer	**Winter**
1st Pump Off	1595 ft.	1588 ft.
2nd Pump Off	1596 ft.	1589 ft.
All Pumps Off	1597 ft.	1590 ft.

Ex. 3:13; Ex. 24. However, according to Rick Cooper, there was no change in

generating capacity:[5]

> . . . During the Summer Pool level we reach a limit at the lower reservoir elevation (749.5') before we are able to generate all the usable water out of the upper reservoir. Lowering the total volume for Winter Pool level allows the same amount of generation, still limited by the lower reservoir elevation (749.5') but allowing us to generate the upper reservoir down to a lower elevation.

Ex. 24.

34. At some point prior to the 2004 maintenance outage, the operating level was reduced to elevation 1596, presumably in recognition of the settling of the dike. *Ex. 8:117.* However, due to settling of the dike at the point where the staff gauge was attached, the true operating level prior to the 2004 outage was elevation 1595. *Ex. 8:117.* This fact was not recognized by the Taum Sauk operating personnel, who continued to record the maximum operating level as elevation 1596. *Ex. 8:117.* When Taum Sauk went back on line after the 2004 outage, it was operated to elevation 1596. *Ex. 8:117.* However, this elevation now represented the actual elevation of the water level. *Ex. 8:117.* The actual operating level of the UR was thus unintentionally raised by one foot. *Ex. 8:117.*

35. A change in the UR operating level was implemented in October 2005 after the discovery of the failure of the gauge piping anchoring system. *Ex. 18:1; Tr. 2:300.* The effect of this change in operating level was inquired into with several Ameren witnesses: Warren Witt, the Manager of Hydro Operations, explained, ”1594 . . . was an indicated level. And we knew that it was not a real elevation because the gauges were degraded. And it was actually . . . intended that an indicated level of 1594 would be a real elevation of 1596 because that’s

[5] By e-mail on December 23, 2002, to Schoolcraft, Fitzgerald, and others.

what we had always operated." Tr. 5:1064. Steve Schoolcraft, Generation Coordinator for Ameren Energy, stated with regard to the actual versus indicated levels of the reservoir in 2005, that 1594 was an indicated level and knowing what we know now, he didn't know that that was an actual level. Tr. 7:1240. Shawn Schukar, Vice President of Ameren Energy, testified that the amount of energy offered into MISO decreased in October, 2005, because the traders believed that Taum Sauk was operating with two feet less water in the UR. Tr. 13:2426. Traders monitor the indicated level of the reservoir, not the actual level. Tr. 13:2426-2428.

36. The top two feet of water in reservoir, called the "head", could generate more power than the water at the bottom because of the greater weight and height of the water. Tr. 7:1238-1239. The value of that water at the top of the reservoir would vary depending on the market price of power at the time of generation. Tr. 7:1238-1239. The presence or absence of the top two feet of water would have to be accounted for in Ameren's offer of power into the MISO market. Tr. 13:2424-2425. Schoolcraft, the Generation Coordinator, described any change in megawatt hours by lowering the operating level of the reservoir from 1596 to 1594 as "insignificant". Tr. 3:1241. Likewise, Schukar, the Vice President of Ameren Energy, said the change would be 60 or 120 megawatts, not a "huge amount." Tr. 13:2465-2466. Schoolcraft and Schukar characterized the reduction in megawatt hours with a drop in operating level differently than did Taum Sauk Superintendent Rick Cooper, who described the decision to lower the pool as "unpopular" and costing "generation $$." *Ex. 20:1.*

Operations at Taum Sauk—Pace of Operations:

37. Taum Sauk was operated more in the five years immediately prior to the breach than it was in the previous thirty-five years. *Ex. 29:2.* According to Warren Witt, this was because of a turbine upgrade in 1999 and the "differences in the power markets." *Ex. 29:2.*

38. New pump/turbines were installed in 1999, increasing pumping flow to 3,000 cfs per unit from 2,450 cfs for each of the original units. *Ex. 3:7.* Both units at Taum Sauk could be put on full load in a few minutes. *Ex. 3:13.*

39. The replacement of the two turbines in 1999 increased the efficiency of the Taum Sauk units, lowered the generated megawatt cost, and decreased the amount of time required to pump-back water to fill the UR, making it economically possible to run the Taum Sauk plant daily. Tr. 5: 956-961.

40. Due to the turbine replacement, the generation units went from "approximately 42 percent to 44 percent efficient up to 69 to 71 [percent efficient, which was a] very significant [improvement]." Tr. 5: 957. Consequently, the units were "operated every day that [Taum Sauk] was available for dispatch." Tr. 5: 956.

41. Prior to the replacement of the turbines, Taum Sauk was "an infrequent operator and only generated usually in extreme temperature conditions for… peak load or in emergency start to replace power that [AmerenUE] had lost unexpectedly in the system." Tr. V. 5: 956: 13-16.

42. In the fall of 2005, MISO ran the Taum Sauk unit almost everyday. Frequently, there were two generation runs, a short morning run and a run in the

afternoon. Because the turbine replacement increased the efficiency of the units, the cost of pumping back water into the UR decreased. This made nightly pump back economically possible because the units could pump back in a narrower window of time, allowing Taum Sauk to be more available to pick up load when necessary. Tr. 5: 957-958.

43. Taum Sauk essentially allowed UE to store excess energy that was available from its base load steam plants during periods of lower load or lower requirements, by using that excess energy to fill the UR. Tr. 5:869. The stored energy could then be used during times of peak demand by using the water in the UR to generate electricity. Tr. 5:869.

44. On May 20, 2000, David T. Fitzgerald, then Manager of Taum Sauk, wrote:[6]

> I have been contacted several times recently with requests to operate Taum Sauk outside of what I consider to be prudent operational limits. This has included generating over the top of the lower reservoir dam and pumping back with two pumps below the previous guidance provided for levels to secure pumps. In the case of generating over the top of the dam, doing such could result in severe action by FERC due to a licensed condition violation and also subsequent litigation by anyone downstream who is affected. We have been allowed by FERC to operate without flood warning systems, mainly due to the fact that persons downstream would have some time to prepare and be aware of impending flood conditions from weather reports. Flooding due to generation falls outside of the residents and downstream users expected conditions. We have been required by FERC to develop an Emergency Action plan for potential or actual flood conditions due to dam breaks of the upper or tower reservoirs. Common sense and logic concludes that we should not place ourselves into a condition that we are required to have Emergency Action Plans for.

[6] By e-mail to Charles Kempf, Larry Weiman, Gerald Beckerle, Richard Post, Thomas Buhr, Jim Diederich, Chris Iselin, Karl Blank, and Dan Jarvis.

> Since the upgrade of the units there is increased motivation to capitalize on the investment Ameren made by utilizing the units as much as possible. Everyone feels the pressure to maximize generation revenue. Caution must be exercised to operate in accordance with sound operating judgement [*sic*], within the constraints of the FERC license, Taum Sauk Operating Manual and any additional Operating Orders. I am attaching an operating order that includes some normal operations limits from the operating manual and previously provided orders and tables. Please review this order and provide it to your operators and dispatchers.

Ex. 25.

45. Fitzgerald testified that the underlying reasons for writing this e-mail were to "recognize the possible pressure that [operators] were feeling to ensure efficient operations and then to remind [the operators and those in the Ameren Energy trading organization] of—with the desire [sic] to maximize generation comes—we do not eliminate the restraints and the requirements that we have associated with operating the plant." Tr. 5:857. Fitzgerald wanted to "clarify what the constraints on the power plant [were] . . . ." Tr. 5:858. This e-mail became part of the Taum Sauk Operating Manual. Tr. 5:863.

The 2004 Outage:

46. During a scheduled maintenance outage in the Fall of 2004, a liner and a new control system were installed at the UR. *Ex. 3:8-9; Ex. 8:118.* The liner project was under the direction of Ameren Project Engineer Steven Bluemner. *Tr. 2:290.* The control system project was under the direction of Ameren System Engineer Thomas Pierie. *Tr. 3:430.* The two projects were independent and both Bluemner and Pierie reported separately to their supervisors in St. Louis. *Tr. 2:371, 3:434.* There was no general supervising engineer on site at Taum Sauk with authority over both projects. *Tr. 2:371.*

47. In the course of his work at Taum Sauk in 2004, Bluemner surveyed the UR to determine the exact elevation of the low point. *Tr. 2:294, 329.* However, Bluemner only passed this information on to Tom Pierie. *Tr. 2:294, 403-4, 3:466-7.*

48. Other projects also were undertaken at Taum Sauk during the 2004 outage, including the upgrade of the "historian" and human/machine interface ("HMI") and the installation of fiber optic cable between the UR Programmable Logic Controller ("PLC') and the common PLC. *Ex. 9:2.*

49. The 2004 outage ended on November 15, 2004. *Ex. 8:119.* After the outage, but before October 2005, the pumps were programmed to automatically shut off at elevations 1594 and 1596, respectively. *Ex. 3:13.*

50. The liner was installed to stop or reduce leakage through the UR dike. *Ex. 3:8-9; Ex. 8:118.* The UR had a long history of settlement and high leakage, increasing to about 60-100 cfs between 1999 and 2003. *Ex. 3:11-12, 34.* Leakage increased significantly in 1999 when the plant was operated more extensively after the installation of new pump turbines. *Ex. 3:11.* The liner installed in 2004 reduced total leakage from the UR from 10-100 cfs to 5-10 cfs. *Ex. 3:12, 31.* The liner project was described as follows in a letter from Rick Cooper to the FERC:

> The purpose of this project was to reduce the amount of leakage from the upper reservoir through the original concrete liner system and expansion joints . The scope of work included the installation of a geo-synthetic liner system which consisted of a geo-composite underlayment and an 80 mil textured High Density Polyethylene (HDPE) liner. The liner was attached to embedded HDPE Polylock strips by extrusion welds at the base of the slopes and secured with bolted stainless steel battens at the top of the slopes and parapet

> walls. The seams between liner panels were made by fusion or extrusion welds. Drawdown of the reservoir began on September 9, 2004 and was taken out of service on September 10, 2004 when the access tunnel bulkhead was lowered. The access tunnel bulkhead was closed on November 15, 2004 at which time the reservoir was released for operation.

Ex. 10:2.

51. Bluemner testified that the liner project was driven by economics because the UR was losing a lot of water in leaks – 1.5 feet daily -- that could have been used to generate electricity. *Tr. 2:319.*

52. The FERC Independent Panel of Consultants concluded:

> The experience that the embankment and parapet wall survived maximum water levels between Elev. 1595 and 1596 many times between 1963 and 2004 with leakage out of the reservoir ranging from 10 to 100 cfs indicates that the dam was stable for the conditions present before the liner was installed in 2004.

Ex. 3:32.

The Control System Project – The Gauge Piping and Anchor System:

53. The liner project included the installation of four perforated HDPE pipes to house the sensors used by the new control system. *Ex. 3:8-9; Ex. 8:118.* The top of the parapet wall was at elevation 1598 at the location of the gauge piping. *Ex. 3:15.* Two of the four pipes were intended to be used for the sensors, one was intended to be filled with concrete, and the remaining pipe was a spare. *Ex. 8:118.* The four pipes were bound together by attachment at several points to a Unistrut. *Ex. 8:120.*

54. The original design for anchoring the gauge piping could not be implemented because it was considered likely to damage the new liner. *Ex. 8:118; Tr. 2:336.* A new anchor system was designed by Shaw-EMCON based

upon two wire ropes anchored at the top and the bottom of the dike; the gauge piping was then to be secured to the wire rope with eye bolts. *Ex. 8:118.* The new design did not include filling one pipe with concrete. *Ex. 8:118.* As built, due to the irregular slope of the dike face and the variable distance from the gauge piping to the wire ropes, turnbuckles were used. *Ex. 8:118.*

55. The turnbuckles in the gauge piping anchor system at the UR were not secured with a locking nut or spot weld, but relied solely on thread-to-thread friction. *Ex. 8:120.* As a result, some of the turnbuckles came loose under the stress of vibrations during the pumping and generating operations at Taum Sauk and the anchoring system failed, allowing the gauge piping to swing freely. *Ex. 8:120.* Likewise, the pipe clamps attaching the gauge piping to the Unistruts slid off of the struts in several locations, allowing the pipes to move individually. *Ex. 8:120.*

56. A graph of water level readings during the pump-back operation on December 1 and 2, 2005, shows large fluctuations, indicative of vigorous swaying of the gauge piping due to the turbulence created by the discharge of both pumps working simultaneously. *Ex. 3:23 and Fig. 7-13.* A review of pump operations during 2005 by the FERC Independent Panel of Experts shows that the UR water level indications are reasonably stable until early August. *Ex. 3:23.* Beginning in early August, the water level plots begin to show the erratic behavior that increased until December 14, 2005. *Ex. 3:23.*

57. The gauge piping tended to straighten out to some degree during the generation operation. *Ex. 3:25.*

58. The failure of the gauge piping anchoring system allowed the gauge pipes to move, shifting the position of the piezometers and causing actual water levels to be about four feet higher than the level readings showed. *Ex. 8:123.* The FERC Independent Panel of Consultants stated:

> UE measured a 14 foot lateral displacement of the transducer pipes over an arc length of 119 feet in the displaced pipe as found after the breach event. This results in a calculated vertical movement of about 3 feet for the enclosed transducers. Adding 3 feet to the maximum measured water level of 1593.74 gives an adjusted water level of 1596.74.

Ex. 3:26.

59. A comparison of the penstock level readings and the UR level readings on December 13, 2005 – the day before the breach – shows that the actual water level in the UR was 4.2 feet *higher* than indicated by the UR piezometers. *Ex. 3:19.*

60. The failure of the gauge piping anchoring system was discovered on October 5, 2005. *Ex. 8:122.* Warren Witt told the MSHP that the gauge piping had not been anchored properly:

> Mr. Witt stated the hardware that was used to make the housing of the level indicators was not satisfactory. He stated the housing should have been much heavier and connected to the reservoir wall by drilling and fastening them directly to the wall. He stated this was not done because he believed the engineers were afraid of drilling into the wall and liner and causing water leakage.

Ex. 28:1.

61. A plan was immediately developed to repair the anchoring system. *Ex. 8:122.* The operating level of the UR was reduced by two feet upon discovery of the failure of the gauge piping anchoring system by lowering the programmed

automatic shut-off from 1596 to 1594, “so that we won’t pump over the reservoir walls.” *Ex. 3:14, 21; Ex. 8:122.* Richard Cooper wrote on October 7, 2005:[7]

> At the upper reservoir: We have four 4" pipes going down into the reservoir that carry our pressure transducers that indicate upper reservoir level. A week or so ago we noticed that the reservoir was fuller than normal after pumpback was completed. We saw yesterday that these pipes have come loose from their mooring and have a bend in them down about 50 feet. We have been able to see this now because we have been finishing our normal daily generation run earlier in the day. This bend in the pipes gives us a false reading and causes the reservoir level to look lower than it actually is. Until these pipes can be re-attached we are lowering the pumpback shutdown setpoint to 1594, down from 1596. We want to give ourselves enough cushion so that we won't pump over the reservoir walls. We will be having a diver look the situation over next week to see if he can re-attach the pipes without draining the upper reservoir.
>
> * * *
>
> We feel confident that lowering the upper reservoir level shutdown setpoint will keep us from over pumping the reservoir wall.

Ex. 18:1-2.

62. On October 9, Rick Cooper commented on the pressure he was subjected to after lowering the level of the UR:[8] “We need the diver to inspect this ASAP even if he has to make a special trip. The lower max level we are keeping in the upper reservoir amounts to some MWs and I'm sure "everyone" wants to know what we are going to do.” *Ex. 31.*

63. Steve Bluemner was in charge of repairing the gauge piping anchoring system. *Tr. 2:399-400.* A diver surveyed the damaged gauge piping on October 11, 2005, in order to determine the feasibility of the repair work. *Ex. 18:1.*

[7] By e-mail to Witt, Birk, Bluemner, Jeff Scott, and others.

[8] By e-mail to Bluemner, Ferguson, Pierie, and Jeff Scott.

Bluemner repeatedly attempted to schedule an outage for the repair work, but was rebuffed by the Ameren marketing unit. *Tr. 2:301-2, 303, 304-5.*

64. On November 14, 2005, Cooper raised the possibility of a three-week outage to repair the gauge piping:[9]

* * *

> The upper reservoir liner has been in service for a year. Of what we can see it looks OK. But we are unable to see the bottom 25 feet With an upper reservoir outage we would be able to inspect the entire surface. We also have some slope wall anchor plates that have pulled loose that could be repaired. Bluemner may have some other things to do or look at. We still have to repair the level gage [*sic*] piping soon and by the spring we would be able to see if this repair is a permanent fix or not.

* * *

Ex. 11:2.

65. On November 23, 2005, Bluemner wrote as follows:[10]

* * *

> Regarding the level gage [*sic*] piping, all materials are on hand to make the repairs and, as you know, I tried to get this completed in early November but couldn't work out the schedule with Power Supply due to the warm weather. Unfortunately the diver is unavailable during weekdays at this time (and probably won't be available through the end of the year) to make the repairs. It may be possible to coordinate his work on a weekend and I will pursue this with the diver. If the reservoir were drained, this would be the best time to make these repairs.
>
> Please let me know if you have any questions and keep me posted in regard to draining the reservoir.

Ex. 11:1.

66. Warren Witt refused to let the repair of the gauge piping anchoring

[9] By e-mail to Schoolcraft, Witt, Bluemner, Pierie, Jeff Scott, Ferguson, Birk, and others.

[10] By e-mail to Cooper, Schoolcraft, Witt, Pierie, Jeff Scott, Ferguson, Birk, and others.

system wait until the planned spring outage. *Ex. 29:2.* However, he did nothing to obtain the outage necessary to repair the gauge piping anchoring system.

The Control System Project – The Instrumentation:

67. The control system installed under Pierie's supervision was intended to mimic the operation of the relay-based control system that it replaced. *Tr. 3:430.* The new system relied upon several Programmable Logic Controllers ("PLCs") which could be programmed to produce appropriate outputs based on an analysis of various inputs. Because Pierie was engaged in other projects in addition to the Taum Sauk control project, a consulting engineer, Tony Zamberlan, was hired to design the Taum Sauk PLC-based control system. *Tr. 3:431.* In November, 2005, Pierie was transferred to another project and off of the Taum Sauk controls project over the objections of Rick Cooper and Bob Ferguson. *Ex. 30; Ex. 30-A.*

68. There were 9 PLCs at Taum Sauk. A PLC is like a computer, it analyzes inputs and generates outputs. Zamberlan worked for Tom Pierie and worked with American Governor, installing a PLC-based system to control the turbines for generating or pumping back. *Tr. 1:117.* There was one PLC at the UR, one at the Lower Reservoir, one each for Units 1 and 2, a Common PLC and one for a Liquid Rheostat, a device used to start large motors. *Tr. 1:118.* Zamberlan reviewed the drawings of the existing relay-based control system and converted it to PLC logic. *Tr. 1:188.* Zamberlan did not keep any record of the programming changes he made at Taum Sauk other than the last backup, which he turned over to Ameren in February, 2005. *Tr. 2:220-221.*

69. The inputs to the PLCs that controlled the UR at Taum Sauk came from two sets of sensors. *Ex. 8:115.* The primary sensors consisted of three 0-100 psi pressure-sensitive piezometers (GE Druck 1230 transmitters) that were hung in the UR at elevation 1500. *Ex. 3:14, 48.* These piezometers produce an electrical signal proportional to pressure. *Ex. 3:14.* The three electrical signals were converted to pressure (feet of water) and then into UR water surface level. *Ex. 3:14.* The signals were transmitted to Taum Sauk, the Bagnell Dam control center, and to the St. Louis control center. *Ex. 3:14.* The output of the three piezometers or level sensors was averaged. *Ex. 8:115.*

70. One of the three piezometers – TX1 -- had been removed from service on September 27, 2005. *Ex. 3:20-21.* When tested after the breach, piezometer TX2 produced readings about 7.86 feet *higher* than the reference curve, while TX3 produced readings about 0.85 feet higher than the reference curve. *Ex. 3:21.* When found, the PLCs had correcting adjustments programmed into them of -9.38 feet for TX2 and -2.40 feet for TX3. *Ex. 3:21.* If the piezometers were located at elevation 1500 as intended, the adjustments would have resulted in water level readings about 1.5 feet *lower* than the actual UR water level. *Ex. 3:21.* However, TX2 was also found to be unusually sensitive to temperature and produced readings about 7.11 feet *higher* than actual when the water temperature was below five degrees. *Ex. 3:21.* At the time of the breach, the water temperature in the UR was in the five degree range, resulting in average piezometer readings about 3.56 feet *higher* than actual. *Ex. 3:21.*

71. In addition to the piezometers, back-up sensors consisting of four

Warrick conductivity probes were placed in pairs above and below the highest and lowest water levels, respectively, expected during normal operation of the UR. These probes – designated the Hi and Hi-Hi and the Lo and Lo-Lo probes – were designed to sound an alarm and initiate a hard shut-off if activated. A fifth Warrick probe was placed as a reference at the bottom of the UR. *Ex. 3:15.* Unusually, the alarm was sounded by activation of the Hi-Hi probe rather than the Hi probe. *Ex. 3:16.* This design is contrary to normal alarm and trip practice. *Ex. 3:16.*

72. Tom Pierie personally installed the level sensors and the Warrick probes during the 2004 outage. *Tr. 3:468.* It was important that these instruments be installed at the correct, pre-determined elevations. *Tr. 3:468.* These elevations were determined by the plant operating staff. *Tr. 3:514.* The correct measurement was determined from the elevation of the parapet wall at the gauge house, supplied to Pierie by Bluemner. *Tr. 3:469.* The instrument cables were measured and marked with tape at the attachment point. *Tr. 3:469-70.* Pierie knew that the parapet wall was not level when he originally hung the instruments and he made certain that the Hi and Hi-Hi probes were placed lower than the low point on the parapet wall. *Tr. 3:471-72.*

73. The hard shut-off triggered by the Warrick probes imposed significant stress on the components of the Taum Sauk plant and was to be avoided if possible. *Ex. 8:115.* The PLCs were therefore programmed to shut off the pumps in a gentle manner based on the average elevation reading received from the three piezometers. *Ex. 8:115-116.* On December 14, 2005, the PLCs were

found to be programmed to shut off Pump No. 2 at elevation 1592 and Pump No. 1 at elevation 1594. *Ex. 8:115.*

74. The Hi and Hi-Hi probes were activated by immersion in water, completing the circuit from the reference probe. *Ex. 3:15.* The upper probes were tested in the fall of 2004 as follows:

> First, the probes were circuit-checked to ensure that they would activate the pump shutoff signal and the alarm. Second, the probes were placed in water to simulate their operation in the upper reservoir. The pump shutoff signal at the plant was concurrently monitored to verify that the probes properly activated the pump shutoff signal and alarm when the probes were placed in water. Third, once the upper reservoir was filled, the Hi and Hi-Hi probes were immersed in the reservoir to confirm that the probes properly activated the pump shutoff signal and alarm.

Ex. 3:15.

75. The Hi probe was designed to be set at elevation 1596.0 and the Hi-Hi probe at elevation 1596.2. *Ex. 3:15; Ex. 8:115.* These levels violated the design parameters of the UR in that a hard shut-off would not occur until less than one foot of freeboard remained rather than the design minimum of two feet of freeboard. *Ex. 8:116.*

76. On November 30, 2004, the Hi probe activated and tripped Unit No. 2 when the UR water level was at elevation 1595.0. *Ex. 3:51.* Later that day, the Lo-Lo probe relay lost power and shut down both units. *Ex. 3:51.* An e-mail from Richard Cooper that day set out the auto-stop programming as follows:

UPPER RESERVOIR AUTO-STOP PROGRAMMING ***November 30, 2004***	
1st Pump Off	1592.0 ft.
2nd Pump Off	1596.0 ft.
All Pumps Off	1596.5 ft.

Ex. 3:51.

77. Cooper actually permitted Taum Sauk to operate on November 30, 2004, without the upper Warrick probes. In an e-mail, Cooper stated:[11]

> After I wrote the email below both units auto shutdown on what appears to have been due to the new Warrick probes for the upper reservoir. Relay 86DT picked up for both units. 86DT picks up in generate mode on extreme low level in the upper reservoir or when power is lost to the Warrick probes. We had plenty of level in the upper reservoir at the time, approx 1575. So the thought is we had an intermittent power blip to the Warrick probe relays and they shut down the units. Normally the units shutdown based on level from the level transducers. These are the setpoints I've sent out in emails from time to time. The Warrick probes are hard wired contacts that set above the normal pump shutdown levels; and there are corresponding Warrick probes that sit below the normal generate shutdown levels. The Warrick probes are emergency shutdowns monitoring extreme low and extreme high levels in the upper reservoir. Tonight the generate Warrick probes took both units off.
>
> We have temporarily disabled the Warrick probes in both the generate and pump modes for tonight only. That means the Osage operators need to keep a close watch on the upper reservoir levels in generate and pump modes. The level setpoints I emailed out today should still shut down the units at the levels I indicated based on the level transducers. The Osage operators need to make sure this happens. There are no emergency backups now. In addition, if you lose upper reservoir communications (no levels being displayed) and the last reading you saw was up near the top in pump or near the bottom in generate you need to shutdown the units immediately. The Unit PLCs have not been programmed to shut down the units if communication (level indication) is lost, thinking we had enough time to get someone on site and we had the Warrick probes to back us up. We do not have Warrick probes backing us up, now. Also, if communication is lost between Osage and Taum Sauk such that control (Unit Start and Stop) is lost, call me immediately to shutdown the units or provide local level readings by sight.
>
> Tony Zamberlan is due in on the AM on Wednesday, Dec 1st to help us troubleshoot this loss of power to the Warrick Probes (loose

[11] To Zamberlan, Pierie, Hawkins, Schoolcraft, Jeff Scott, and others.

> wire, flakey transformer, flakey Warrick probe relay, etc). We will at the least install a time delay in this circuit if we are not able to find the intermittent power loss and restore the Warrick probe operation. We don't want to run without the Warrick probes any longer than tonight.

Ex. 19.

78. Comments within the PLC coding and Revision 15 to Drawing 8303-P-26648 documented that the Hi and Hi-Hi probes were moved to elevations 1596.7 and 1596.9, respectively. *Ex. 3:15.* It does not appear that the probes were ever, in fact, located at these elevations. *Ex. 3:15-16.*

79. The upper Warrick probes were found at elevations 1597.4 and 1597.7, respectively, after the breach on December 14, 2005. *Ex. 8:115.* Tom Pierie found the Hi and Hi-Hi probes at elevations 1597.4 and 1597.7, respectively, on October 7, 2005. *Ex. 3:26; Ex. 13.* Pierie told the MSHP on the day of the breach, that he found the probes at "seven and four inches from the top of the reservoir wall" in October, 2005, and that "[t]hey should have been twenty-four and twenty-two inches from the top of the wall." *Ex. 13:1; Tr. 3:489.* No documentation exists recording the resetting of the Hi and Hi-Hi probes to the higher elevations. *Ex. 3:15-16, 26.* Pierie explained that waves would sometimes hit and activate the probes at their original setting and that they were probably raised for that reason, but he did not know when or by whom. *Ex. 13:1.*

80. Pierie did not reset the Hi and Hi-Hi probes in September, 2005, when he found them at 17 and 18 inches, respectively, higher than they were supposed to be. *Ex. 3:26, Tr. 3:489.* Both of these levels were higher than the lowest point on the summit of the UR parapet wall at elevation 1596.99. *Ex.*

3:26; Ex. 8:116. Pierie testified that he did not realize that at the time. *Tr. 3:507.*

81. The upper Warrick probes were moved to elevations 1597.4 and 1597.7, respectively, on December 1, 2004, by Tony Zamberlan, Jeff Scott and others. *Ex. 9:3; Ex. 28:1; Tr. 1:153-154, 2:231, 3:474.* Pierie indicated that the probes were raised after "a hi probe trip in December 2004." *Ex. 14:2.* Pierie stated to the MSHP, "Zamberlain [*sic*] advised him the 'trip' of the probes was caused by finally getting enough water in the lower reservoir, to pump back the levels higher in the upper reservoir, hence the reason for moving the probes levels." *Ex. 14:2.* Pierie testified that, in early December, "I was at my desk. I got a phone call from Tony Zamberlan saying we had a high-level trip. We had the probes set too low. *Tr. 3:511.*

82. Warren Witt told the MSHP that Zamberlan raised the probes "sometime in October or November of 2005, after the hurricane winds affected the reservoir by causing waves to lap over the top of the parapet walls." *Ex. 28:1.* Witt "believed the level indicators were moved up so that the wave action would not set the alarm off." *Ex. 28:1.* Zamberlan stated as follows in an e-mail on December 2, 2004:[12]

> Tom,
>
> They were supposed to do that today. I thought it was the 125VDC but we were up at the Upper Reservoir to pull up the high level Warrick probes to 1596.5 and we heard a terrible noise come from the Warrick relay. It lasted a couple seconds. We were either going to replace it or swap it with the high level probe to see if it is a relay problem or something else.
>
> That is the current status.

[12] To Pierie.

Ex. 7:1.

83. Zamberlan finalized and issued the schematic drawing of the UR controls on December 15, 2004, showing the Hi and Hi-Hi probes at elevation 1596.7 and elevation 1596.9, respectively. *Ex. 42:5.* These elevations were not correct as Zamberlan and Jeff Scott had moved the upper Warrick probes to elevations 1597.4 and 1597.7, respectively, on December 1, 2004. *Ex. 9:3; Ex. 28:1.*

84. The Hi-Hi probe activated at 5:38 P.M. CST on December 27, 2004, when the UR water level was at elevation 1586.4 and neither pumping nor generating was going on. *Ext. 42:6.*

85. Multiple Hi-Hi probe alarms occurred between 4:03 P.M. CST and 5:49 P.M. CST on February 15, 2005. *Ext. 42:7.* The probes were being tested at the time. *Ext. 42:7.*

86. A Hi-Hi probe alarm occurred at 5:15 P.M. CDT on July 20, 2005, when the UR water level was at elevation 1573.8 and the plant was generating. *Ext. 42:7.*

87. A Hi-Hi probe alarm occurred at 3:50 P.M. CDT on August 14, 2005, when the UR water level was at elevation 1591.6 and the plant was generating. *Ext. 42:8.*

88. The upper Warrick probes did not trigger during the event of December 14, 2005. *Ex. 3:17, 20.* Testing of the probes after the breach showed that they performed satisfactorily in all test conditions. *Ex. 3:26.*

89. The Warrick probes were designed to operate independently – in

parallel – but were reprogrammed in December 2004 so that they would not trigger unless both probes of each set were simultaneously stimulated for at least 60 seconds. *Ex. 3:15; Ex. 8:115.* Pierie stated to the MSHP that, while the programming change from parallel to series for the lower Warrick probes "made sense," the same change to the higher Warrick probes "did not make sense and [he] would have advised not doing"; however, he was not consulted on the change *Ex. 14:2.* Additionally, due to a programming error in the PLCs that occurred on September 16, 2005, the Warrick probes as found could only shut off Pump No. 1. *Ex. 3:26; Ex. 8:115.*

90. When the breach of the UR occurred, the level reading was elevation 1593.7, whereas the actual level was elevation 1597.6. *Ex. 3:19; Ex. 8:123.* This level was above the low point of the parapet wall, but below the Hi-Hi probe at 1597.7. *Ex. 8:123.* The Rizzo Report states, "Had the protection probes been maintained at their as-design levels at El.1596 and El. 1596.2, the uncontrolled release would likely have been avoided." *Ex. 8:123.* The FERC Independent Panel of Consultants' Report states, "We conclude that the Hi and Hi-Hi conductivity probes were located too high to initiate pump shutdown and prevent overtopping of the upper reservoir." *Ex. 3:26.*

91. After the breach the Warrick probes were removed and tested by Tom Pierie and Robert Scott, a Taum Sauk technician. *Ex. 9:3.* Pierie tested the upper probes simply by wetting them to see if they would trip, which they did. *Ex. 14:2.*

Overtopping and Overtopping Events:

92. The overtopping of embankment dams is one of the most frequent causes of embankment dam failures. *Ex. 3:28*.

93. While all embankment dams will fail if overtopped, some rockfill dams are more sensitive to failure by overtopping than others depending on the steepness of the downstream slope, the compactness of the rockfill, and the percentages of sand and fines in the rockfill. *Ex. 3:28.* The Taum Sauk UR dike and parapet wall "combined to give an embankment more vulnerable and sensitive to over topping than most embankment dams." *Ex. 3:35.*

94. An overtopping occurred on September 25, 2005, possibly under the influence of high winds associated with Hurricane Rita. *Ex. 42:8.* Cooper stated as follows in an e-mail:[13]

> This last weekend, Sunday, I had a couple of guys here on overtime on the AM getting ready for a ceremony we had Monday at the plant. The guys also did a walkdown of the plant to make sure everything was OK for us to ignore the plant on Monday.
>
> When the guys went up to the upper reservoir they witnessed what they described as a Niagara Falls at the Northwest comer of the reservoir. We had some small rock washed away at the base of the parapet wall which left a trench a foot deep in some areas. The wave action on the upper reservoir surface was caused by some high winds when "Rita" was going through the area. The immediate action taken was to put the units on in Generate to lower the upper reservoir level to stop the falls.
>
> Monday we didn't get a chance to look at things due to the all day ceremony. And anyway, load dispatch took the units off prematurely at 1595 elev, I guess due to load coming in on the system.
>
> This morning Jeff and I went up to the upper reservoir when the

[13] To Pierie, Hawkins, Jeff Scott, Bluemner, Ferguson, and Witt.

controls indicated we were at 1596 elev. There were no waves on the surface but we could see a couple of wet areas on the west side of the reservoir parapet walls. We pulled the vehicle up to these wet areas and climbed on top of the vehicle to see the water level. We were surprised to see the level within four inches of the top of the wall. It was above the top batten strip holding the vinyl on. This level is at least six inches higher than what I remember from when we first came back from the controls upgrade last fall. Jeff looked at the level xmtrs when we got back to the plant and found one of the three reading a foot higher than the other two. When he took that one xmtr out of the average we now read about 1596.2. I still feel we are about another .4 feet higher than that. Jeff then added a .4 adjustment to the two remaining xmtr average making the current level now read 1596.6. We'll check on what this does to the actual level the next several mornings.

Two things we can do or should do. Overflowing the upper reservoir is obviously an absolute "NO"--"NO". From the wave action on this past Sunday we need to

1) Permanently lower the present operating level of 1596 to 1595 or

2) Add a wind indicator to the upper reservoir so that an alarm can warn the Osage operators that the level needs lowering ASAP when at 1596 elev .

Jeff hasn't looked into the program that much yet but we need to know or alarm when one of the xmtrs is out of range of the other two. A foot difference is too much for one xmtr to be out.

Overflowing the upper reservoir or wave action causing the reservoir to overflow can eat away at the base of the parapet wall foundation and could cause a collapse of a parapet wall section and then it would be all down hill from there -- literally. The dam would severely erode and cause eventual failure of the dam. Those kind of headlines we don't need.

[Lowering] the current operating level from 1596 to 1595 wouldn't be popular. I'm not sure what that would mean in $$ of generation. But we need to add additional monitoring and tighten up existing controls if we're going to continue to operate at 1596. I'm asking for some help and direction. For now we have built in the .4 fudge factor and switched out the one xmtr. We will be looking into all the xmtr indications soon to see if they have all drifted off some. Maybe we need to establish periodic calibration checks on all our xmtrs instead of waiting for one to fail or go into alarm. We haven't done that on this new system. We've been trying to eliminate work

not expand on it.

Ex. 20.

95. On September 27, 2005, Taum Sauk personnel observed that the water level in the UR was only four inches below the top of the parapet wall. *Ex. 8:125; Ex. 20.* An upward adjustment of 0.4 ft. was programmed into the level readings in the PLCs, but no investigation was undertaken to determine why the upper Warrick probes had not been activated. *Ex. 3:14; Ex. 8:125; Ex. 20.* Although Warren Witt, UE's hydro manager, told the Missouri State Highway Patrol that "he did not know anything about the 4" fudge factor or the water being so close to the top of the wall," *Ex. 29:2,* he was listed as one of the recipients of Cooper's lengthy e-mail explaining these points. *Ex. 20.*

96. It was determined in early October, 2005, that the overtopping that occurred on September 28, 2005, was not due only to unusually high winds generated by Hurricane Rita, but also involved gauge piping issues. *Ex. 29:2.*

97. At Rick Cooper's direction, Tom Pierie developed a plan to install a wind speed transmitter at the UR in order to lower the water level in the UR when high winds occurred in order to avoid overtopping by wave action. *Ex. 14:1.* Pierie wrote on October 7, 2005:[14]

> We're going to install a wind speed transmitter at the upper reservoir. The value will show on the HMI and will have an associated alarm. We can also incorporate an automatic gen start to bring down the reservoir level to some set point if we feel the need.
>
> An additional Warrick probe, set 2" below the pump stop set point (1596) will be installed so that the level transmitters can be checked

[14] To Cooper, Jeff Scott, Ferguson, Bluemner, and Robert Lee.

> from time to time. When the Warrick probe is covered with water it will display on the HMI. We'll also add each individual level transmitter reading at the HMI for reference
>
> With the PVC pipes (housing the upper reservoir level transmitters) moving off or bowing out of the unit strut supports by at least 5' (picture attached), caused the transmitter to rise in the pipe which moved up the reference point: Steve B[luemner] will be lining up a diver to refasten the pipes to the unit strut. Once this is done we can see if there is a drop in the level reading and then we can readjust the reading.
>
> The Hi and HiHi Warrick probes are 7" and 4" from the top of the wall respectively . So if on 9-27 the level was 4" below the wall the Hi level Warrick should have picked up The elevation at the visitor's platform and the gauge house are the same. Another note the top of the batten strip is 14" from the top of the wall if that helps get a bearing on where the level was at on 9-27 . If you want to lower the Hi level probes we can do that but I think we chose the levels so that normal wave action wouldn't cause nuisance trips.
>
> I'm hoping to have this all done by the end of the month.

Ex. 17.

98. On September 30, 2005, Taum Sauk personnel examined the upper Warrick probes and found them to be set at seven inches and four inches from the top of the parapet wall, respectively. *Ex. 8:125.* The probes were not then reset to ensure two feet of freeboard. *Ex. 8:125.*

99. On the early morning of December 14, 2005, both units were in pumping mode. *Ex. 3:16.* Unit No. 2 shut-off automatically at 4:39 a.m. at elevation 1591.6. Unit No. 1 was manually shut-down by the Bagnell Dam operator at 5:15 a.m. “just shy” of elevation 1594. *Ex. 3:16.*

100. The UR was overtopped by the end of the pumping cycle on December 14, 2007. *Ex. 3:17.* The breach formed at about 5:15 a.m., just as the second unit was manually shut down by the Bagnell Dam operator. *Ex. 3:17.* The FERC

Independent Panel of Consultants concluded, "[T]he breach occurred very quickly after shut down of the second pump." *Ex. 3:24.* About 25 minutes after the initial breach formed, the breach measured 720 feet wide at the top and 430 feet wide at the bottom, encompassing Panels 88 through 99. *Ex. 3:17-18.* Other areas of overtopping occurred at Panels 10-12, 100-103, 43-56, and 69-74. *Ex. 3:19.* The maximum water level in the UR on the morning of December 14, 2005, was between 1597.7 and 1597.9. *Ex. 3:19.* The FERC Independent Panel of Consultants concluded, "[T]he water level could not have reached as high as Elev. 1598." *Ex. 3:24.* On December 14, 2005, Dave Fitzgerald saw seven separate areas where the UR overtopped. *Ex. 23:1.*

101. A plot of maximum daily water level indications for December 2005 shows that level indications as high as that reached on December 14, 2005, were achieved on many earlier days. *Ex. 3:25.* Since reservoir failure did not occur on those dates, it may be inferred that the failure of the anchoring system for the gauge piping was progressive and that the disparity between the actual water level and the water level readings produced by the piezometers grew progressively larger and reached its maximum on December 14, 2005. For a period of twelve minutes during the pump-back operation on the night of December 13-14, 2005, the piezometers did not show that the water level increased at all, although both pumps were operating. *Ex. 3:25.*

Management:

102. Leading up to the breach, there were no less than three separate Ameren companies, with separate chains of command, performing work at Taum

Sauk. UE, a regulated public utility, is the owner of Taum Sauk; UE's purpose is to serve 1.2 million Missouri electric ratepayers and 125,000 natural gas ratepayers. *Ameren website.* Ameren Energy is an affiliate of UE, "responsible for optimizing the load and generation of AmerenUE" by putting a "portfolio together to minimize the cost to serve the load and to maximize the opportunity associated with off-system sales." *Tr. 13:2416-17.* The Ameren Energy trading group "is responsible for placing the assets into the wholesale marketplace," *Tr. 13:2417,* while Ameren Energy's dispatching group, consisting of the power supply supervisors, is responsible for making sure UE has sufficient energy to meet load requirements. *Tr. 7:1235.*

103. The chain of command at AmerenUE at the time of the breach went from Richard Cooper, Superintendent of Taum Sauk, up to Warren Witt, Manager of Hydro Operations, then to Mark Birk, Vice President of Power Operations. *Tr. 3:1044.* Birk reported to Alan Kelley, Senior Vice President of Generation, and Kelley reported to Tom Voss, Executive Vice President of AmerenUE, the subsidiary, and Executive Vice President and Chief Operating Officer of Ameren Corporation, the holding company. *Tr. 11:2152-2160.* In his role with the parent, Ameren Corp., Voss had the executives of Ameren Energy and Ameren Service, among others, reporting directly to him. *Tr. 11:2157-2159.* Voss reported to Gary Rainwater, then President of AmerenUE and Chairman of Ameren Corporation.

104. UE's incentive compensation plan created pressure for operators to keep the plant operating. One criterion for obtaining a bonus is "equivalent

availability" of the plant to generate. Mark Birk explained "equivalent availability" as a measure of the total period of time in a year that the unit is available to run. *Tr. 7:1463.* Another factor in determining incentive compensation for managers and supervisors was "MISO Day 2 communication and flexibility and response." *Tr. 7:1464.* Birk indicated the importance of meeting generation commitments to the MISO market. *Id.*

105. Rick Cooper was Superintendent of the Taum Sauk plant. Taum Sauk personnel, specifically the plant manager or superintendent, were responsible for "ensuring that the equipment was maintained, that is, was available for dispatch and that it was operated in a safe manner." *Tr. 5:826.*

106. Warren Witt was promoted to the position of manager of UE's three hydroelectric facilities in the fall of 2005. *Ex. 29:2.* One reason for his promotion was to improve the operating standard at the hydro plants. *Ex. 29:2.*

107. Mark Birk was Vice President of UE Power Operations. *Ex. 40:1.* Birk told the MSHP that there was no financial reason to keep Taum Sauk running in late 2005, but that "they just thought the problem was not that serious." *Ex. 40:2.* On October 10, 2004, Birk wrote:

> After going through the sequence of events concerning Rush Island Unit #1 this past weekend I wanted to make crystal clear my expectations concerning the plant operating groups.
>
> The Operations Department (i.e.; operating supervisors, general supervisors, etc.) is responsible and accountable for the safe and efficient operation of the generating units. If tripping of equipment or the unit is warranted due to safety or asset preservation requirements that decision must be made in a timely manner by the operating group aside from any requirements Trading, Generation Services or the ESO may have. ESO and Trading will generally push to keep a unit on but the ultimate authority and accountability

> resides with the plant operating staff.
>
> Decisions concerning testing and/or configuration manipulation of operating equipment reside with the operating staff. If Operations doesn't understand or isn't knowledgeable of the procedure being performed it is their responsibility to have a questioning attitude and deny any requests that they aren't fully confident in performing. The Operating group cannot be afraid to push back and challenge any request that they feel doesn't make sense or could potentially incur additional unwarranted risk.
>
> With the impending Day 2 energy markets and the current reorganization at the fossil plants I look toward the Operating Departments to take a leadership role in making Ameren the recognized performance leader in the industry.
>
> Please make sure that this information is conveyed to all of your operating groups and let me know if you have any questions or concerns.

Ex. 44.

108. For Ameren Services, the group responsible for engineering services at Taum Sauk, the engineers reported to a Civil Structural Group Supervisor in St. Louis who reported to the Manager of Generation Project Engineering who reported to the Vice-President of Generation Engineering, Technical Services. That VP in turn reported to a Senior Vice-President. *Tr. 2:360-362.* Ultimately, authority terminated with Tom Voss.

109. At the top of the management hierarchy were Tom Voss, Executive Vice President of Ameren Energy, Ameren Services and AmerenUE, and Chief Operating Officer of Ameren Corporation. Above Voss was Gary Rainwater, chairman, chief executive officer and president of Ameren Corporation.

110. In response to a request from the Office of Public Counsel, Tom Voss provided a list of errors in judgment that lead to the failure of Taum Sauk. *Ex. 53.*

Voss stated the following:

> 1. Poor communication between the engineering and operating groups - The engineering and operating groups did not communicate as effectively as they should have. For example, only certain people had information about the low point of the parapet wall at the upper reservoir, and that information was not effectively communicated to all necessary personnel.
>
> 2. Lack of a proper understanding of the design basis – AmerenUE operations and engineering personnel did not have a good understanding of the design basis for the upper reservoir. For example, individuals did not fully understand the original design's requirement of 2 feet of free board. In addition, changes were made to instrumentation and computer programs without an analysis of design basis implications.
>
> 3. Failure to recognize the severity of problems and to act in a conservative manner – Operations and engineering personnel did not recognize the severity of the gage piping problem that was identified in the fall of 2005, and they did not take sufficiently conservative steps in response to the problem. For example, while people believed that lowering the operating level of the reservoir by 2 feet was sufficient at the time, that judgment was not sufficiently conservative. Likewise, the determination that the gage piping problem was not a safety issue that necessitated an immediate outage was not sufficiently conservative.
>
> 4. Problems with initial construction – The various investigations have determined that the original construction of the upper reservoir was not consistent with the design.

Ex. 53.

Management – Outage Requests:

111. Outages for fueling, maintenance and repair of AmerenUE's generating units are scheduled by the Generation Coordinator for Ameren Energy, a separate affiliate company in the Ameren system. The Generation Coordinator, Steve Schoolcraft, took requests from AmerenUE power plants for outages, special conditions, or tests to set an economical schedule for those

activities where “we have options.” *Tr. 7:1218-1219.*

112. To schedule an outage, the Generation Coordinator needs to know what power level the unit will need to be at, whether the plant can operate in regulation with the ability to change power level, the duration of the activity, and that the plant has the manpower and resources to coordinate the test or repair. *Tr. 7:1219.* The Generation Coordinator has discussions with plant operators about outages. *Tr. 7:1224.*

113. Outages are usually requested by telephone or e-mail. *Tr. 7:1228.* However, Ameren Energy also has an electronic request submittal system now. *Tr. 7:1228.* Each plant has a Planning Department Coordinator who normally calls in. *Tr. 7:1226.* Calls can sometimes come from a higher level supervisor or superintendent. *Tr. 7:1226.* Once Ameren Energy receives a call for an outage, a discussion is held with the trading group on what they anticipate the market will be and the time period needed to schedule the outage. *Tr. 7:1226.* Then, the group proposes an option that they think is the most economic way to do it. Typically, an agreement is reached. *Tr. 7:1226.*

114. Typically, outages are planned in advance. *Tr. 7:1219-1220.* The Generation Coordinator anticipates what the load is going to be and configures the assets to meet the load. *Tr. 7:1219-1220.* The load is closely related to market prices. *Tr. 7:1219-1220.*

Management – Refusal to Permit Outage at Taum Sauk

115. Steve Bluemner, Project Engineer in charge of the liner project, was unable to schedule an outage to repair the gauge piping anchoring system in the

fall of 2005. Bluemner had the material to repair the gauge piping by October 27, 2005. Bluemner repeatedly tried to arrange an outage with the Power Supply Department at Ameren Energy. Bluemner called first on a Wednesday to arrange a Thursday outage. He was told to call back “tonight or tomorrow.” Bluemner called back the next day to get the outage for Friday, and then called back Friday to get it for Saturday. Bluemner called again from home on the weekend, on a Sunday, trying to get the outage for Monday. Bluemner called everyday for a week to get Ameren Energy to schedule an outage without success. *Tr. 2:301-305.*

116. When scheduling an outage in November 2005 to repair water seal lines at Taum Sauk, Bluemner was advised by the Generation Coordinator that Bluemner must be "100 % sure both pumps will be available by the time we need to pump back Monday night." *Ex. 37; Tr. 7:1261.* The Vice President of Ameren Energy, Shawn Schukar, when asked to respond to the instance where Ameren Energy required an engineer to be “100% sure” when an outage would begin and end, responded that "it would put pressure on the plant operators to accurately portray what they can or can't do." *Tr. 13:2416, 2437.*

117. Steve Bluemner explained that no outage was subsequently scheduled in an e-mail sent on November 23, 2005: "I tried to get this done in early November but couldn’t work it out with Power Supply due to warm weather.” *Ex. 11.*

118. Those working at Taum Sauk or on Taum Sauk projects considered economic justifications for requesting outages for repairs and maintenance. In

the fall of 2005, on September 27, Superintendent Richard Cooper expressed his concern with dropping the Upper Reservoir operating level from 1596 to 1595 in an e-mail. *Ex. 20.* Cooper wrote that decreasing "the current operating level from 1596 to 1595 wouldn't be popular. I'm not sure what that would mean in $$ of generation. But we need to add additional monitoring and tighten up existing controls is we're going to continue to operate at 1596." *Ex. 20.*

119. On October 8, 2005, Cooper reminded Steve Bluemner, in regard to setting up an inspection of the gauge piping by a diver, "the lower max level we are keeping in the upper reservoir amounts to some MWs and I'm sure 'everyone' wants to know what we are going to do." *Ex. 31.*

120. On November 14, 2005, Cooper by e-mail asked that employees involved with Taum Sauk consider cost involved in modifying repair schedules, including repair to the gauge piping anchoring system and general UR liner repair. *Ex. 11.* Bluemner responded: "While it would be good to be able to inspect the penstock liner and upper reservoir this spring, I don't think it justifies economically to drain the reservoir for these items alone." *Ex. 11.*

121. UE instituted a system whereby each day was designated green, yellow or red, depending on system stability or high market prices or both. *Tr. 10:1948.* On a "red day," unnecessary system alterations and maintenance were discouraged. *Tr. 10:1949; Ex. 49.*

122. Rick Cooper, the Taum Sauk superintendent, supposedly had final authority to take the plant out of service for safety reasons. *Ex. 40:1.* However, Cooper indicated that he was pressured by his supervisors to keep the plant

running, stating that in the past he had been overruled when he requested outages. *MSHP Interview of Richard Cooper, March 16, 2007, p. 4, ¶ 19.*

Investigations:

123. UE retained an expert consultant, Paul C. Rizzo, Ph.D., P.E., to investigate the Taum Sauk incident and he issued his report on April 7, 2006. This report is available on the FERC website. UE's consultant reached these conclusions:

> It is our conclusion that the **root cause** of "***the uncontrolled, rapid release of water from the Upper Reservoir"*** was the breach of the Rockfill Dike—a stability failure at the northwest corner of the Reservoir brought on by a rapid increase in the pore pressure at the Dike/foundation interface, stemming from the original design and construction which was flawed.

Ex. 8:130 (emphasis in original).

> The design and specification of the instrumentation and control systems were inadequate from a dam safety perspective. Furthermore, an inadequate initial design for the instrumentation supports led to field changes which led to the failure of the supports and errant readings of the water level in the Upper Reservoir. Additionally, the misplacement of HI and HI-HI Probes, as a result of human error, effectively disabled the as-designed level protection. These three items combined to allow the overtopping of the reservoir during the pump back cycle on the morning of December 14, 2005. Specific conclusions with respect to the Barrier Analysis are listed below.
>
> > --Design and specification of the instrumentation system was not sufficiently conservative. Had the protection probes been maintained at the design elevations, the overtopping event may not have occurred.
> >
> > --Even given the loss of the level protection, overtopping still could have been prevented had the level control instrumentation supports not failed.
> >
> > --Based on our judgment, plant operators and technicians were following operational and inspection procedures as

> provided by AmerenUE. However, we note that operator training in terms of dam safety was inadequate.
>
> --Operation of the Upper Reservoir in terms of dam safety including maintaining the necessary freeboard was not adequately understood within the AmerenUE Organization.
>
> --Responsibilities for plant operation and dam safety were combined under a single individual. Anyone with this job description may have to potentially balance dam safety and operational constraints.
>
> --Adequate design quality assurance was not followed by AmerenUE and their consultants. Consultants and engineers, including software suppliers, should have followed an ANSI qualified program. This would include documentation of the intent of a design and would also require checks and verifications before making any changes to final design.
>
> It is our overall conclusion that instrumentation failure and human error constitute primary and secondary contributing causes respectively to the Event. If AmerenUE elects to rebuild the Upper Reservoir, operational procedures and training in dam safety should be implemented. Also, consideration should be given to separating dam safety responsibility and operational responsibility.

Ex. 8:125-126.

124. The FERC Staff conducted an investigation into the Taum Sauk incident and issued its report on April 28, 2006. This report is available on the FERC website. The FERC Staff investigation reached the following conclusions:

> 1. The project had historically operated with a minimum of two feet of freeboard on the lowest section of the parapet wall. Following installation of a geomembrane liner in 2004, AmerenUE operated the project to fill the upper reservoir within one foot of the lowest section of the parapet wall. Post breach evidence shows the reservoir may have been routinely filled to within 0.25 foot of the lowest section of the parapet wall.
>
> 2. The December 14, 2005 breach was preceded by significant wave overtopping that occurred on September 25, 2005. Factors involved with this event were waves due to winds from the

remnants of Hurricane Rita combined with a reservoir level pumped to within 0.4 foot of the top of the parapet wall.

3. On September 27, 2005, AmerenUE adjusted the reservoir control programming to account for the difference between the actual reservoir levels and the readings from the reservoir level instrumentation.

4. On October 3-4, 2005, AmerenUE personnel discovered that the conduit which housed the instrumentation for monitoring reservoir levels was not properly secured to the dam. Deterioration of the instrumentation tie-down allowed the conduits to move adversely impacting the reservoir level readings. The instrumentation readings showed reservoir levels that were lower than actual levels. As a safety measure, AmerenUE adjusted the reservoir level control programming to shut down the pumps when the instruments showed the reservoir levels were two feet lower than normal settings.

5. Two Warrick Conductivity Sensors were used as a safety system for shutting down the units in case of high water levels. The sensors would send a signal to shut down the units when they became wet. The sensors were physically relocated to a height that was higher than the lowest point on the parapet wall. Therefore, if the Warrick Sensors were contacted by water, the Upper Dam would already be in an "overtopping" condition.

6. Modifications made to the reservoir control programming adversely affected how the signals from the Warrick Sensors were managed and reported. The modifications required that both sensors make contact with water to initiate shutdown. This removed a layer of redundancy to the safety system.

Ex. 22:7-8.

125. FERC also retained an independent panel of consultants ("IPOC") to investigate the Taum Sauk incident and the panel issued its report on May 25, 2006. This report is available on the FERC website. The panel reached these conclusions:

It is the Panel's opinion that the cause of the December 14, 2005 failure was overtopping of the parapet wall and embankment. The possible modes of failure for the breach event of this dam and

the factors which made this dam especially vulnerable and sensitive to overtopping have been discussed in Section 7.

Although this dam and parapet wall combined to give [sic] an embankment more vulnerable and sensitive to overtopping than most embankment dams it is the opinion of this Panel that the primary root causes of failure on this particular date were those factors which caused the overtopping to occur. The secondary root causes or contributing factors are those factors which combined to make this embankment more vulnerable to failure by overtopping.

A summary of primary root causes is given below. These factors contributed to the fact that overtopping occurred.

• The pressure transducers that monitored reservoir water levels became unattached from their supports causing erroneous water level readings.

After these transducers became loose from their supports, their position heads changed and the reservoir levels indicated in the PLC system gave reservoir levels lower than the actual reservoir levels. The fact that the new system installed in 2004 did not consist of a structural support system anchored to the face slab enabled this mode of instrument failure to occur. As constructed it was inferior to all of the water level measuring systems used on the Project between 1963 and 2004.

• The emergency backup level probes were set at an elevation above the lowest points along the parapet wall; thus, they failed their protection role because this enabled overtopping to occur before the probes could trigger shutdown.

These probes were a good conceptual second line of defense. However, the Hi-Hi Warrick Probe had to be in contact with the reservoir water for 60 seconds in order to trip off the last pumping unit. The Hi-Hi Warrick Probe unfortunately was set at Elev. 1597.7 at Panel 58 where the top of the parapet wall was at 1598.0 It did not apparently occur to those setting this probe that there were 33 wall panels with their tops lower than the Hi-Hi probe with the lowest one (Panel 72) having a top at Elev. 1597.0 Thus the emergency backup system was effectively eliminated by this error

of setting the Warrick Probe at an elevation which would allow considerable overtopping, if the main system would fail.

• The normal operating high water levels of 1 ft. below the top of the parapet wall was too near the top of the wall to allow for any mistakes of misoperation.

This low free board was not realistic for the system adopted for monitoring water levels in 2004. A more rigorous study of the potential errors in the measurements should have been made before adopting this low free board which required such a high accuracy from this system. The adoption of this 1 ft. free board was totally inconsistent with having personnel making key design and installation decisions who were not even aware of the lowest elevation of the parapet wall within the nearest 1 ft.

• Visual monitoring of the Upper Reservoir water levels was almost nonexistent and there was no systematic “ground–proofing” recorded of the relationship of the top of the wall and associated water levels actually being achieved.

• There was no overflow spillway to safely carry accidental over-pumped water downstream and below the dam. The omission of a spillway from the design was a most important root cause of this failure. If a spillway had been constructed with a capacity of the two pumping units, an overtopping failure would not have occurred.

A bullet point for a secondary root cause of the December 14, 2005 breach is given below with detailed explanation.

• The marginally stable dumped “dirty” rockfill embankment and associated parapet wall atop the dam, constituted an unforgiving containment structure. It could not tolerate the additional pore pressures and erosive effects of the overtopping water plunging over the top of the parapet wall onto the narrow dam crest and cascading down the steep 1.3:1 slope.

The steep dumped rockfill slopes composed of rockfill with as much as 20% fines and 45% sand sizes and smaller, make this dam especially sensitive to erosion due to overtopping and also conducive to increases in

> pore pressures during overtopping because it is not free draining. Storing water against a 10 ft. high parapet wall founded on the dam crest is also a feature which makes this dam vulnerable to overtopping because the overflowing water impinges on the dam crest at a velocity of 25 ft./sec. which enhances erosion and makes a large release of erosive energy possible, should the erosion at the downstream footing of the wall allow tipping or sliding of the wall. As indicated in previous sections of this report there were plenty of indications, earlier in the history of this dam, that there was "dirty" rockfill in portions of this dam and much of the repairs as well as comments in writing were directed to the area of the dam that breached between Panels 88 and 99.

Ex. 3:35-36.

126. DNR's Water Resources Center, Dam and Reservoir Safety Program, also conducted an investigation into the Taum Sauk incident. *Tr. 1:19.* DNR reported its findings in a Power Point presentation narrated by Chief Engineer James L. Alexander. *Ex. 1.* Alexander concluded that UE was at fault in the Taum Sauk incident in several respects, including tampering with evidence after the breach. *Tr. 1:44-45, 94.* However, Alexander was not familiar with either the Rizzo Report or the two FERC reports into the Taum Sauk incident. Although Ameren personnel removed and tested the Warrick probes immediately following the breach, the Commission specifically finds that no tampering with any evidence occurred.

127. The Missouri State Highway Patrol also conducted an investigation of the Taum Sauk incident in order to determine whether any criminal conduct had occurred. The Highway Patrol investigation did not reveal a suspect or suspects for criminal prosecution. After reviewing this report, Attorney General Nixon

announced that he would not pursue any criminal charges in relation to the Taum Sauk incident. *Attorney General's website, News Release* May 18, 2007.

Legal Actions:

128. On October 2, 2006, the FERC approved a Stipulation and Consent Agreement between UE and the FERC Office of Enforcement. ***In the Matter of AmerenUE,*** Project No. 2277 (*Order Approving Stipulation and Consent Agreement,* issued October 2, 2006) (*"FERC Order"*). The Order listed a number of alleged violations by UE of both FERC regulations and specific conditions of the Taum Sauk license, *FERC Order,* ¶¶ 7-10, however, UE did not admit any of them. *Id.,* ¶ 11. In resolution of the charges, UE agreed to pay a $10 million civil penalty to the United States and to place a further $5 million into escrow to fund "enhancements at or in the vicinity of the Taum Sauk project." *Id.,* ¶ 12.

129. The FERC Agreement required the project enhancements to "include an advanced emergency management system…," along with enhancements directed toward economic development, quality of life, the environment, and education at or near Taum Sauk. *Id.,* ¶ 13. The FERC Order approving that agreement also required UE to immediately implement a Dam Safety Program (DSP) for Taum Sauk and the Osage Project. *Id.* ¶ 15. It specified that UE would "create a new position of Chief Dam Safety Engineer…[that] will report to senior management and will have primary responsibility for dam safety throughout [UE's] system," along with establishing the "authority to order all necessary corrective action if dam safety is in question, including issuance of cease generation or stop work orders when necessary." *Id.* The terms of the

Stipulation and Consent outline that failure to timely pay the set penalties, comply with the DSP or any other provisions "shall be deemed a violation of a final order of the Commission . . . and may subject [UE] to additional action under the enforcement and penalty provisions of the FPA." *Stip. & Consent at page 11,* ¶ *32.*

130. On December 13, 2006, the Attorney General of Missouri filed a civil suit against UE in the Circuit Court of St. Louis City, Missouri, Case No. 0622-CC07160, seeking costs and expenses, damages under various theories of relief, penalties, and punitive damages "for its complete indifference to or conscious disregard for the safety of others." ***State of Missouri v. Union Electric Co.,*** Case No. 0622-CC07160 (07RE-CC00005 *after change of venue*) (*Petition,* filed December 13, 2006) p. 17. That action, since moved to the Circuit Court of Reynolds County, Missouri, and now numbered 07RE-CC00005, is still pending, but is reported to be close to settlement.

Public Service Commission Involvement:

131. On May 22, 2007, the Commission issued its Report and Order disposing of UE's general rate increase request, filed on July 7, 2006. ***In the Matter of Union Electric Company, doing business as AmerenUE,*** Case No. ER-2007-0002 (*Report & Order,* issued May 22, 2007). For the sake of completeness, Staff reminds the Commission of its treatment of Taum Sauk in that case:

> On December 14, 2005, the upper reservoir at AmerenUE's Taum Sauk pumped storage facility in Reynolds County, Missouri ruptured, allowing 1.5 billion gallons of water to rush down the side of a mountain and through Johnson's Shut-Ins State Park.

Fortunately, no one was killed in the flood, although several people were injured, but the raging waters caused extensive property and environmental damage.

AmerenUE claims to accept full responsibility for the reservoir failure and the resulting damages. Consequently, its rate increase request does not include any money to pay for cleanup of the park, reimbursement of the expenses incurred by the State of Missouri, or for resolution of individual damage claims. Furthermore, AmerenUE has not asked to recover the cost of fines or penalties imposed by the federal or state governments as a result of the Taum Sauk disaster.

In a rate case such as this, the Commission establishes the rates a utility may charge based in part on the expenses the utility incurs to provide service to its customers. If an expense is not allowed into the utility's cost of service, its rates will be set at a level which does not allow the company to recover that cost from its customers. Since AmerenUE will not be allowed to include the Taum Sauk expenses in its cost of service as calculated for this case, those costs will not be recovered from ratepayers and will instead have to be paid with shareholder funds.

The exclusion of the direct expenses of cleaning up the Taum Sauk mess is not the end of the matter. AmerenUE used the Taum Sauk pumped hydro power plant to provide electricity to its customers, as well as to generate power to sell off-system in the wholesale electricity market. With the Taum Sauk plant unable to generate electricity because of the failure of the reservoir, AmerenUE will have to generate electricity for its own customers using other, more expensive, power plants. Furthermore, it will be unable to sell power from the Taum Sauk plant in the profitable wholesale market. Since profits from off-system sales are used to offset AmerenUE's cost of service, and thereby reduce the rates paid by AmerenUE's customers, the loss of revenue from the Taum Sauk plant could have adverse consequences for ratepayers, aside from the direct cost of cleanup.

To avoid harming ratepayers, AmerenUE agreed that the various studies and cost models that are used to determine the company's cost of service should be based on the assumption the Taum Sauk plant has remained in operation throughout the test year. By using these models that assume the Taum Sauk plant is still operating, the Commission will be able to establish rates that protect ratepayers from having to pick up the bill for either the cleanup costs or the lost revenues resulting from the Taum Sauk

disaster.

Id., at pp. 10-12.

Reconstruction of Taum Sauk:

132. On August 15, 2007, FERC authorized UE to reconstruct Taum Sauk. *FERC website.*

Proposed Conclusions of Law

Jurisdiction:

The first question necessarily is whether this Commission has jurisdiction to address the Taum Sauk incident at all in view of the fact that Taum Sauk is directly licensed and regulated by the government of the United States acting through the FERC. A review of the applicable statutes and case law reveals that the State of Missouri, acting through this Commission, retains jurisdiction of rates and reliability over Taum Sauk, in addition to its traditional police power regulation of the safety and adequacy of UE's system.

State Regulation of UE:

UE is an "electrical corporation," a "gas corporation," and a "public utility" within the intendments of § 386.020, (15), (18) and (42), RSMo Supp. 2006, and is thus subject to the "jurisdiction, control and regulation" of this Commission. That jurisdiction extends to safety. Section 393.130.1, RSMo Supp. 2006, requires that "every electrical corporation . . . shall furnish and provide such service instrumentalities and facilities as shall be safe and adequate and in all respects just and reasonable." Likewise, pursuant to § 386.310.1, RSMo 2000,

the Commission is authorized and required to provide for the safety of the public with respect to utility operations:

> The commission shall have power, after a hearing had upon its own motion or upon complaint, by general or special orders, rules or regulations, or otherwise, to require every person, corporation, municipal gas system and public utility to maintain and operate its line, plant, system, equipment, apparatus, and premises in such manner as to promote and safeguard the health and safety of its employees, customers, and the public, and to this end to prescribe, among other things, the installation, use, maintenance and operation of appropriate safety and other devices or appliances, to establish uniform or other standards of equipment, and to require the performance of any other act which the health or safety of its employees, customers or the public may demand, including the power to minimize retail distribution electric line duplication for the sole purpose of providing for the safety of employees and the general public in those cases when, upon complaint, the commission finds that a proposed retail distribution electric line cannot be constructed in compliance with commission safety rules. The commission may waive the requirements for notice and hearing and provide for expeditious issuance of an order in any case in which the commission determines that the failure to do so would result in the likelihood of imminent threat of serious harm to life or property, provided that the commission shall include in such an order an opportunity for hearing as soon as practicable after the issuance of such order.

The Missouri Supreme Court has held that the Commission has "plenary power to coerce a public utility corporation into a safe and adequate service." ***State ex rel. Missouri Southern R. Co. v. Public Service Commission,*** 259 Mo. 704, ___, 168 S.W. 1156, 1163 (banc 1914).

Federal Regulation of Taum Sauk:

However, Taum Sauk is a hydroelectric plant and, as such, it is licensed and regulated by the Federal Energy Regulatory Commission ("FERC") under Title I of the Federal Power Act ("FPA"), *codified at* 16 U.S.C. § 792 *et seq.*; *and see* ***Federal Power Commission v. Union Electric Co.,*** 381 U.S. 90, 85 S.Ct.

1253, 14 L.Ed.2d 239 (1965). The FPA has, in most respects, pre-empted state regulation of hydroelectric facilities. "Congress clearly intended a broad federal role in the development and licensing of hydroelectric power." ***California v. FERC*****,** 495 U.S. 490, 496 (1990) ("***California***"); *see also* ***First Iowa Hydro-Electric Coop. v. Federal Power Comm'n*****,** 328 U.S. 152 (1946) ("***First Iowa***"); ***Sayles Hydro Ass'n v. State Water Resources Control Bd.*****,** 985 F.2d 451, 455-56 (9th Cir 1993) (concluding that Supreme Court precedent reflects a finding that FPA occupies the field with respect to regulation of hydroelectric projects); ***Wisconsin Valley Improvement Co. v. Meyer*****,** 910 F. Supp. 1375, 1382-84 (W.D. Wis. 1996) (concluding that FPA occupies the field of hydropower licensing); ***Town of Springfield v. McCarren*****,** 549 F. Supp. 1134, 1155 (D. Vt. 1982), *aff'd*, 722 F.2d 728 (2nd Cir. 1983), *cert. denied*, 464 U.S. 942 (1983) (concluding that hydroelectric plant licensing was left exclusively to the federal government).

Among the considerations within FERC's licensing jurisdiction are "the protection of life, health, and property." *See* 16 U.S.C. § 823; *see also, e.g.,* ***South Carolina Public Serv. Auth. v. FERC*****,** 850 F.2d 788, 792 (D.C. Cir. 1988). While there are no reported cases that specifically address whether FERC occupies the field of regulating safety or enforcement at hydroelectric projects, FERC's own decision in ***Consumers Power Company,*** 68 FERC ¶ 61,077 (1994), shows that FERC views its enforcement authority under the FPA as exclusive, with no authority reserved to the states. FERC also holds that the FPA preempts the field of ensuring safe construction, operation and maintenance

of hydroelectric projects. In ***NEW Hydro*****,** 81 F.E.R.C. ¶ 61,238 (1997); 1997 FERC LEXIS 2519, for example, FERC rejected the Wisconsin Department of Natural Resources' proposed recommendation that the FERC include an article in the license requiring the licensee to comply with state laws governing construction, operation and maintenance of hydroelectric projects. The Commission declined to include the provisions, finding that "FERC regulations are sufficient to ensure project safety and the FPA preempts state administration of project safety." *Id*., at **213.

Residual State Regulation of Taum Sauk – Rates and Reliability:

However, while FERC has authority to protect health and safety at licensed projects, the states retain their traditional power to ensure reliable service and just and reasonable rates for consumers of project powers. Section 19 of the FPA provides in relevant part that:

> As a condition of the license, every licensee hereunder [16 USCS §§ 791a et seq.] which is a public-service corporation, or a person, association, or corporation owning or operating any project and developing, transmitting, or distributing power for sale or use in public service, shall abide by such reasonable regulation of the services to be rendered to customers or consumers of power, and of rates and charges of payment therefor, as may from time to time be prescribed by any duly constituted agency of the State in which the service is rendered or the rate charged.

16 U.S.C. § 812. Section 19 thus affirms state control over matters such as rates and reliability of service to consumers for service from licensed projects.[15] Additionally, this Commission retains its broad jurisdiction over the safety and

[15] Section 27 of the FPA reserves state authority related to "the control, appropriation, use or distribution of water used in irrigation or for municipal or other uses or any vested right acquired therein." 16 U.S.C. § 821. Because this particular provision has no relevance to enforcement and safety issues, we do not discuss it.

adequacy of UE's system as a whole, of which Taum Sauk forms only one part.

Ratemaking:

The Commission is vested with the state's police power to set "just and reasonable" rates for public utility services, subject to judicial review of the question of reasonableness. ***St. ex rel. City of Harrisonville v. Pub. Serv. Comm'n of Missouri,*** 291 Mo. 432, 236 S.W. 852 (1922); ***City of Fulton v. Pub. Serv. Comm'n,*** 275 Mo. 67, 204 S.W. 386 (1918), *error dis'd,* 251 U.S. 546, 40 S.Ct. 342, 64 L.Ed. 408; ***City of St. Louis v. Pub. Serv. Comm'n of Missouri,*** 276 Mo. 509, 207 S.W. 799 (1919); ***Kansas City v. Pub. Serv. Comm'n of Missouri,*** 276 Mo. 539, 210 S.W. 381 (1919), *error dis'd,* 250 U.S. 652, 40 S.Ct. 54, 63 L.Ed. 1190; ***Lightfoot v. City of Springfield,*** 361 Mo. 659, 236 S.W.2d 348 (1951). Section 393.130, RSMo 2000, in pertinent part, requires a utility's charges to be "just and reasonable" and not in excess of charges allowed by law or by order of the commission. Section 393.140, RSMo 2000, authorizes the Commission to determine "just and reasonable" rates.

A "just and reasonable" rate is one that is fair to both the utility and its customers; ***St. ex rel. Valley Sewage Co. v. Pub. Serv. Comm'n,*** 515 S.W.2d 845 (Mo. App., K.C.D. 1974), it is no more than is sufficient to "keep public utility plants in proper repair for effective public service, [and] . . . to insure to the investors a reasonable return upon funds invested." ***St. ex rel. Washington University et al. v. Pub. Serv. Comm'n,*** 308 Mo. 328, 344-45, 272 S.W. 971, 973 (banc 1925).

Ratemaking involves two successive processes: first, the determination

of the “revenue requirement,” that is, the amount of revenue the utility must receive to pay the costs of producing the utility service while yielding a reasonable rate of return to the investors. ***St. ex rel. Capital City Water Co. v. Missouri Pub. Serv. Comm'n,*** 850 S.W.2d 903, 916 n. 1 (Mo. App., W.D. 1993). The second process is rate design, that is, the construction of tariffs that will collect the necessary revenue requirement from the ratepayers. Revenue requirement is usually established based upon a historical test year which focuses on four factors: (1) the rate of return the utility has an opportunity to earn; (2) the rate base upon which a return may be earned; (3) the depreciation costs of plant and equipment; and (4) allowable operating expenses. Colton, "Excess Capacity: Who Gets the Charge from the Power Plant?," 34 Hastings L.J. 1133, 1134 & 1149-50 (1983).

The Prudence Standard:

In ratemaking, the Commission uses a prudence standard to test whether any of a utility’s operating expenses or other costs should be disallowed in whole or in part. Under this standard, the Company’s costs are presumed to have been prudently incurred until “some other participant in the proceeding creates a serious doubt as to the prudence of an expenditure, then the [Company] has the burden of dispelling these doubts and proving the questioned expenditure to have been prudent.” ***State ex rel. Associated Natural Gas Co. v. PSC,*** 954 S.W.2d 520, 528 (Mo. App., W.D. 1997); *quoting* ***In the Matter of Union Electric,*** 27 Mo.P.S.C. (N.S.) 183, 193 (1985), *in turn quoting* ***Anaheim, Riverside, Etc. v. Fed. Energy Reg. Com'n*****,** 669 F.2d 799, 809 (D.C. Cir.

1981). Once the initial presumption of prudence is overcome, the Commission evaluates the prudence of the Company's conduct using a standard of reasonable care requiring due diligence. ***In the Matter of Missouri-American Water Co.,*** 9 Mo.P.S.C.3d 254, 280-281 (2000); ***Union Electric*****,** *supra,* 27 Mo.P.S.C. (N.S.) at 194. The Commission has stated:

> The Commission will assess management decisions at the time they are made and ask the question, "Given all the surrounding circumstances existing at the time, did management use due diligence to address all relevant factors and information known or available to it when it assessed the situation?"

Id. The Commission has also stated:

> [T]he company's conduct should be judged by asking whether the conduct was reasonable at the time, under all the circumstances, considering that the company had to solve its problem prospectively rather than in reliance on hindsight. In effect, our responsibility is to determine how reasonable people would have performed the tasks that confronted the company.

In the Matter of Missouri Gas Energy, 11 Mo.P.S.C.3d 206, 222-223 (2002), *citing* ***Union Electric*****,** *supra,* 27 Mo.P.S.C. (N.S.) at 194, *quoting* ***Consolidated Edison Company of New York, Inc.,*** 45 P.U.R. 4th 331 (1982). In applying the prudence standard, the Commission is mindful that "the act, omission or failure of any officer, agent or employee of any corporation, person or public utility, acting within the scope of his official duties of employment, shall in every case be and be deemed to be the act, omission or failure of such corporation, person or public utility." Section 386.570.3, RSMo 2000.

Discussion:

Using the measure set out above, the Commission can only conclude that the loss of the Taum Sauk plant was due to imprudence on the part of UE. UE

was well-aware of the catastrophic results likely to occur if the UR was overtopped by over-pumping. UE knew, or should have known, that storing water against the parapet wall of a rockfill dam was "unprecedented." UE knew, or should have known, that operating with a freeboard of only one or two feet left no margin for error and required particularly accurate control of the UR water level. Given that circumstance, UE's decision to continue operating Taum Sauk after the discovery of the failure of the gauge piping anchoring system and the consequent unreliability of the piezometers upon which the UR control system was based is frankly beyond imprudent – it is reckless. UE also knew or should have known that the upper Warrick probes had been reset above the lowest point at the top of the UR.

In future rate cases, the Commission's Staff must be vigilant to ensure that no costs related to the Taum Sauk incident are passed on to ratepayers, directly or indirectly. Given the large costs incurred by UE due to the incident, and in light of Ameren's perilous financial outlook in Illinois, the motivation to pass some of these costs on in rates is great. In its 10-K, filed with the SEC, Ameren stated:

> To the extent that UE needs to purchase power because of the unavailability of the Taum Sauk facility, there is the risk that UE will not be permitted to recover these additional costs from ratepayers if such a request is made. The Taum Sauk incident is expected to reduce Ameren's and UE's 2007 pretax earnings by $15 million to $20 million as a result of higher-cost sources of power, reduced interchange sales, and increased expenses, net of insurance reimbursement for replacement power costs.

Ameren's Form 10-K, for the fiscal year ended December 31, 2006, SEC website, p. 19. Additionally, when the Taum Sauk plant is rebuilt, appropriate accounting treatment will be necessary to protect the ratepayers.

Reliability:

What is Reliability?

Neither this Commission nor any Missouri court has ever defined the term "reliability." The plain and ordinary meaning of the term, as found in the dictionary, is "the quality or state of being reliable." *Webster's Third New International Dictionary of the English Language (Unabridged)* 1917 (Springfield, MA: 1986). To be reliable, in turn, is to be "suitable or fit to be relied upon; . . . dependable, trustworthy[.]" *Id.*

With respect to electric service, reliability refers to service interruptions. "[C]ustomers expect uninterrupted service – or nearly so – for their own health and welfare." ***North American Electric Reliability Corporation (NERC): Reliability Criteria and Operating Limits Concepts*** 9 (Ver. 4, Draft 11, June 7, 2007). Service interruptions and reliability are inversely related – more service interruptions mean less reliability. With respect to system reliability, a utility is expected to "protect the generation and transmission equipment from catastrophic damage[.]" *Id.* A system is necessarily less reliable when components are damaged and thus unavailable. "Indeed, the failure to . . . protect generation and transmission equipment will absolutely lead to blackouts, long restoration times, or electric service curtailments, none of which meet the customer's expectations, and all of which jeopardize our nation's health, welfare and security." *Id.,* at 9-10.

Traditionally, NERC defined system reliability in terms of adequacy and security:

> Adequacy — The ability of the bulk power system to supply the aggregate electrical demand and energy requirements of the customers at all times, taking into account scheduled and reasonably expected unscheduled outages of system elements.
>
> Security -- The ability of the bulk power system to withstand sudden disturbances such as electric short circuits or unanticipated loss of system elements from creditable contingencies.

NERC 2007 Long-Term Reliability Assessment 234 (Princeton, NJ: October, 2007). Now, pursuant to the direction of the FERC, NERC is developing a new definition of the term "adequate level of reliability." ***NERC: Definition of "Adequate Level of Reliability"*** 2 (Princeton, NJ: October 1, 2007). NERC's new definition is:

1. The System remains within acceptable limits;
2. The System performs acceptably after credible contingencies;
3. The System limits instability and cascading outages;
4. The System's facilities are protected from severe damage; and
5. The System's integrity can be restored if it is lost.

Id., at 5.

Discussion:

The avoidable destruction of the UR at Taum Sauk is a significant failure of reliability by UE given that one measure of reliability, as shown above, is to "protect the generation and transmission equipment from catastrophic damage[.]" ***NERC: Reliability Criteria and Operating Limits Concepts,*** *supra.* But the Taum Sauk incident is only one of a number of incidents in recent years that suggest that UE must place greater emphasis upon reliability.

Taum Sauk is not the first of UE's plants to suffer catastrophic damage. In 2000, an accidental fire destroyed two of six units at UE's reactivated generating plant at Venice, Illinois. The Venice plant, stretching for a mile along the Illinois

bank of the Mississippi River, was the second oldest in the UE fleet, having entered service in 1942. By 2002, the remaining four units at Venice were retired; they have since been replaced by natural gas-burning combustion turbine generators ("CTGs") used for peaking purposes. The cause of the Venice fire was a ruptured hydraulic line. *Ameren website;* ***In the Matter of Union Electric Company d/b/a AmerenUE Regarding an Incident at the Venice Power Plant in Venice, Illinois, on August 10, 2000,*** Case No. ES-2001-359 (***Electric Incident Report,*** filed January 18, 2002).

Other reliability deficits have been revealed by the effect of severe storms on UE's transmission and distribution system. Severe storms struck metropolitan St. Louis on July 19 and 21, 2006. 646,000 Missouri customers lost service and, while service was restored to about 70 percent of them in five days, it took UE nine days to restore service to all of them. This was the third year in a row for a major summer outage. On July 5. 2004, 217,000 customers lost service after a storm; on August 13, 2005, 225,000 customers lost service. Restoration efforts took about four days in 2004 and 2005. ***In the Matter of an Investigation of Union Electric Company d/b/a AmerenUE's Storm Restoration Efforts in the St. Louis Area,*** Case No. EO-2007-0037 (***Report on AmerenUE's Storm Outage Planning and Restoration Effort Following the Storms on July 19 and 21, 2006,*** issued November 17, 2006); *testimony of Warren Wood, P.E., December 27, 2006,* Case No. EO-2007-0037, Tr. 7: *passim.*

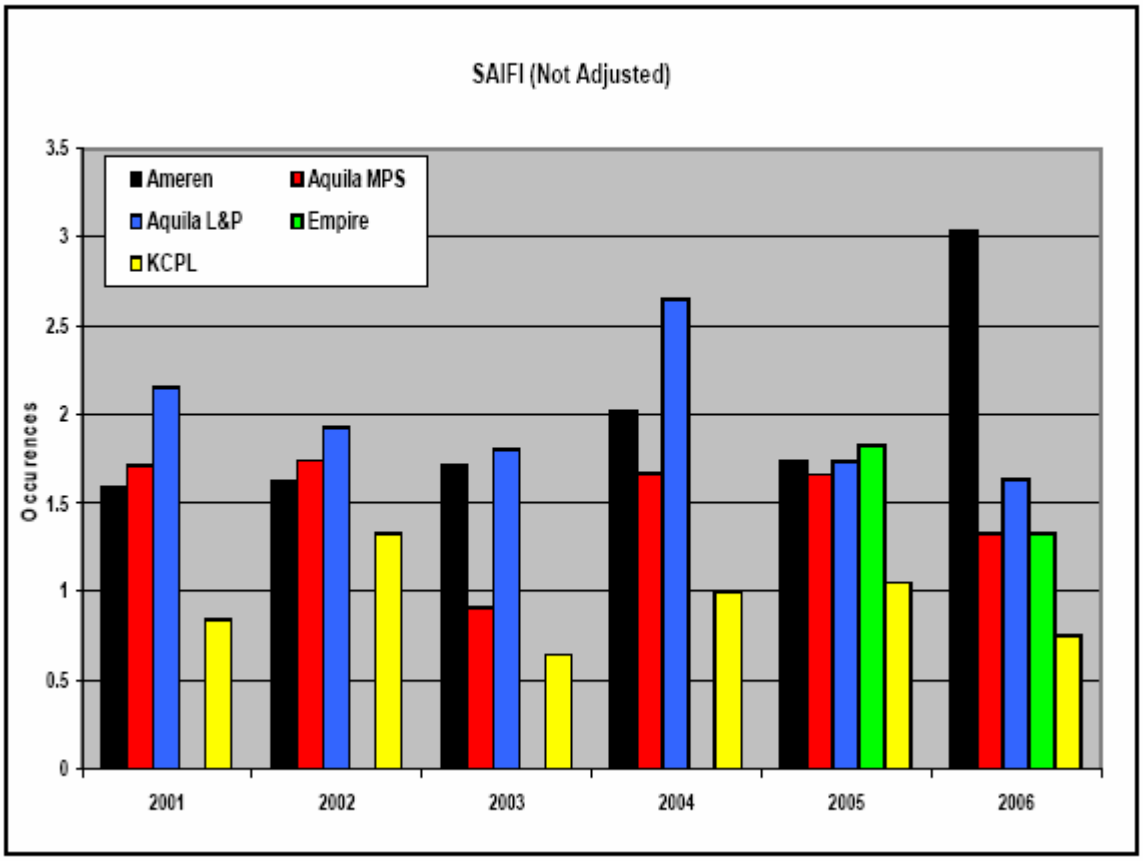
The year 2006 alone had three major outage events. In addition to the July storms referred to above, there was a storm outage in April when a little over

200,000 customers lost service. An ice storm on the night of November 30th - December 1st left about 270,000 customers without service. *Testimony of Warren Wood, P.E., December 27, 2006,* Case No. EO-2007-0037, Tr. 7:5. Another ice storm occurred on January 13, 2007.

One measure of reliability is the System Average Interruption Frequency Index (SAIFI), which is the sum of the customers interrupted over the sum of the customers.[16] Mike Taylor, *What is General System Reliability and How is it Measured? Electric Utility Roundtable on Storm Outage Planning and Restoration and General Service* Reliability (Missouri Public Service Commission, June 1, 2007). Another measure is consumer complaints. The Commission Staff receives more complaints per customer against UE than against any other Missouri electric utility. *Testimony of Warren Wood, P.E., December 27, 2006,* Case No. EO-2007-0037, Tr. 7:22-23. The severity of storm-related outages in St. Louis is a result of UE's below average efforts at vegetation maintenance. *Testimony of Warren Wood, P.E., December 27, 2006,* Case No. EO-2007-0037, Tr. 7: 26 ("I would rate that somewhat average or a little below average.")[17]

[16] SAIFI can be "adjusted" by removing data reflective of unusually severe weather in order to reflect "normal" conditions. Using adjusted figures, UE's SAIFI was nonetheless above average for 2001 through 2005, although among the lowest for Missouri regulated utilities. Mike Taylor, *What is General System Reliability and How is it Measured? Electric Utility Roundtable on Storm Outage Planning and Restoration and General Service* Reliability (Missouri Public Service Commission, June 1, 2007).

[17] Wood rated UE's general maintenance as average, its storm preparation above average, and its storm restoration efforts significantly above average. *Testimony of Warren Wood, P.E., December 27, 2006,* Case No. EO-2007-0037, Tr. 7:24-27.



System-Wide Lessons from the Taum Sauk Incident:

A review of UE's actions – and inactions – at Taum Sauk are instructive; the lessons learned thereby can be applied across UE's system.

Undue Risk:

Actions by UE's employees at Taum Sauk demonstrate a persistent failure to understand the unacceptable and undue risk posed by operating with malfunctioning level indicators and improperly set fail-safe probes. Both of these conditions were known by early October 2005, and yet UE continued to operate the plant until the breach occurred.

On November 30, 2004, UE operated Taum Sauk without the protection of

the fail-safe Warrick probes. In an email, Superintendent Rick Cooper advised that “we have temporarily disabled the Warrick probes in both generate and pump modes for tonight only” and that “the Osage operators need to keep a close watch on the upper reservoir levels[.]” There is no indication that any person was assigned to actually observe the reservoir level during pump back.

After the breach, the Hi and Hi-Hi probes were found at a significantly higher level than they were supposed to be – as a matter of fact, higher than the lowest point of the parapet wall, explaining why these probes never activated during the incident on the morning of December 14, 2005. UE has never been able to explain how these probes were improperly set or to identify the responsible party or parties. In fact, UE was aware of the misplacement of these probes on September 30, 2005, but they were never reset to the proper level. UE thus operated Taum Sauk after October 2005 knowing that the Hi and Hi-Hi probes were effectively disabled.

In the fall of 2005, in response to the September 25, 2005, wind event and in the face of evidence of inaccurate level readings, UE’s response was to reprogram the PLCs with fudge factors and adjust the indicated level of the reservoir. First, on September 27, 2005, a 0.4 foot fudge factor was programmed into the control system, so that elevation 1596.2 was adjusted to read elevation 1596.6. Ex. 20:1. The planned effect of this adjustment was to keep the reservoir at 1596, the operating level maintained since the liner installation in 2004.

On September 27, 2005, Rick Cooper sent an e-mail to Pierie, Bluemner

and others regarding the September 25, 2005, overtopping event. Cooper notes that "[t]here were no waves on the surface but [I] could see a couple of wet areas on the west side of the reservoir parapet walls." *Ex. 20:1.* Cooper also states the reservoir was within four inches of the top of the wall and appeared to be at least six inches higher that it should have been. *Id.* Cooper fails to explain why the walls were still wet, two days after the wave event. In fact, the wet areas show that the UR was overtopped again on September 27.

On October 3, 2005, operators discovered the gauge piping was no longer attached to the anchoring system and was floating freely in the reservoir. UE's response was to lower the pump back automatic shutdown level to elevation 1594. No analysis was undertaken to determine how this adjustment would affect the actual level of the reservoir or whether the size of the adjustment was sufficient. In fact, it appears that the actual level of the reservoir remained at elevation 1596 or higher. The breach itself confirms this conclusion.

Over-compartmentalization:

As described by Tom Voss in the section entitled "Errors in Judgment," engineers and operators at Taum Sauk failed to effectively communicate critical information to each other. Steve Bluemner performed a critical survey whose intent was to protect the integrity of the dike by finding the lowest point in the parapet wall. However, Bluemner only communicated that information to Tom Pierie; there is no indication that the survey information was ever communicated to Tony Zamberlan, the consulting engineer responsible for programming the control system.

There were at least three, and perhaps four, engineering projects going on at Taum Sauk during the 2004 outage. Inexplicably, there was no supervising engineer on site with overall responsibility for all of the projects. Consequently, the projects were poorly integrated, cooperated only sporadically, and critical information was not shared.

Failure to Take Responsibility:

Steve Bluemner was a Project Engineer employed by Ameren Services; he did not work for UE. He was also not part of the operating group at Taum Sauk. Yet Superintendent Cooper made Bluemner responsible for obtaining an outage to repair the gauge piping anchoring system at Taum Sauk. Ameren Services witnesses claimed that plant operators for AmerenUE were responsible for taking a unit out of service for safety reasons. Mark Birk, Vice-President of Power Operations for AmerenUE, testified that "when there is a decision made whether a plant should remain in service or be taken out of service, that decision is made by the plant staff." *Tr. 7:1423.* If an outage for safety reasons was necessary, it is unclear why Bluemner was assigned to arrange it, or whether he even had authority to request it. For whatever reason, the operating staff at Taum Sauk was unwilling to take responsibility for the outage.

More problems began to arise after the installation of the liner in 2004. After the liner was installed, the problem with leakage was substantially reduced, but that change gave way to other issues that were magnified by the fact that the reservoir could actually hold all the water pumped into it at night. The fail-safe Warrick probes became even more important when water was not leaking

through the dike to reduce the water level of the reservoir once it was full. The failure to reset the Hi and Hi-Hi probes after Pierie discovered that they were placed too high on September 30, 2005, is thus all the more inexplicable.

Financial Pressure:

Dividends on Ameren's common stock depend upon distributions made to it by its subsidiaries. *Ameren's Form 10-K, for the fiscal year ended December 31, 2006, SEC website,* p. 4*.* The advent of the MISO market created additional pressure on traders and operators to keep Taum Sauk running. Taum Sauk was a low-cost generating unit. When generation was offered into MISO on a day-ahead basis, the generation chosen by the MISO algorithm to produce electricity was always the lowest cost, most economical source of generation. Taum Sauk was an important producer of low cost generation and was consistently offered into MISO and called upon to generate before other generation.

Richard Cooper, Superintendent of Taum Sauk, told the Missouri State Highway Patrol that he had been pressured by supervisors in the past to keep the plant running. But Cooper's supervisors Warren Witt and Mark Birk denied pressuring Cooper and could not explain Cooper's statement. David Fitzgerald testified that the pressure came from the energy traders and dispatchers.

UE's incentive compensation plan created additional pressure for managers to keep the plant operating. As Mark Birk explained, one criterion for obtaining a bonus is "equivalent availability" of the plant to generate. "Equivalent availability" as a measure of the total period of time in a year that the unit is available to run. Another factor in determining incentive compensation for

managers and supervisors was “MISO Day 2 communication and flexibility and response.” Birk indicated the importance of meeting generation commitments to the MISO market.

Recommendations

Based on the foregoing proposed Findings of Fact and Conclusions of Law, Staff offers these recommendations:

1. That any and all costs, direct and indirect, associated with the Taum Sauk incident be excluded from rates on an ongoing basis. This includes, but is not limited to, the exclusion of rebuilding costs and treating the facility as though its capacity is available for dispatch modeling.

2. That appropriate accounting treatment be given to the monies expended to rebuild the Taum Sauk plant in order to protect the interests of Missouri ratepayers.

3. That UE shall submit to Staff, on an ongoing basis, its accounting treatment for all transactions relating to the reconstruction of the Taum Sauk plant.

4. That a single, on-site, supervising engineer shall be assigned to oversee all engineering projects at a given UE facility. This supervising engineer shall be responsible and accountable for the satisfactory completion of the work, shall have all necessary authority, including authority to determine when, and whether, the unit may be released for operation, and shall report to an officer of UE.

5. That UE's officers, executives and managers shall work only for UE and shall not simultaneously work for affiliates of UE or for UE's parent.

6. That only UE's officers, executives and managers shall be authorized to make decisions affecting UE's facilities and services.

7. That these internal controls shall be reflected in UE's policies, procedures and job descriptions.

8. That UE shall implement a "whistleblower" program whereby employees may report safety concerns directly to UE's officers without exposure to retaliation. Any such reports shall be immediately communicated to Staff.

9. That UE shall designate an officer or executive as its system-wide safety officer. This officer shall have appropriate duties and authority in order to act effectively to protect UE's assets and system, its employees and customers, as well as the general public, private and public property, from undue risk.

10. That UE shall produce and file, within 90 days hereof, its plan for implementing these recommendations.

WHEREFORE, on account of all the foregoing, Staff prays that the Commission will receive its Initial Investigation Report of the Taum Sauk Incident, direct UE to respond thereto within 30 days, adopt Staff's Report and proposed recommendations as its Report and Recommendations herein; and grant such other and further relief as is just in the circumstances.

Respectfully Submitted,

/s/ KEVIN A. THOMPSON
Kevin A. Thompson
General Counsel
Missouri Bar No. 36288

/s/ STEVEN C. REED
Steven C. Reed
Chief Litigation Counsel
Missouri Bar No. 40616

/s/ SHELLEY SYLER BRUEGGEMANN
Shelley Syler Brueggemann
Senior Associate General Counsel
Missouri Bar No. 52173

P.O. Box 360
Jefferson City, MO 65102
573-751-6514 (telephone)
573-526-6969 (facsimile)
kevin.thompson@psc.mo.gov (e-mail)

Attorneys for the Staff of the
Missouri Public Service Commission

Certificate of Service

I hereby certify that a true and correct copy of the foregoing was served, either electronically or by hand delivery or by First Class United States Mail, postage prepaid, on this **24th day of October, 2007**, as set out below:

Steven R. Sullivan, Esq.
Thomas M. Byrne, Esq.
AmerenUE
P.O. Box 66149 (MC 1300)
1901 Chouteau Avenue
St. Louis, Missouri 63166-6149
srsullivan@ameren.com

Lewis R. Mills, Jr.
Christina Baker, P.E.
Office of the Public Counsel
P.O. Box 2230
200 Madison Street, Suite 650
Jefferson City, Missouri 65102
lewis.mills@ded.mo.gov

Robert T. Haar, Esq.
Lisa Pake, Esq.
Haar & Woods, LLP
1010 Market Street, Suite 1620
St. Louis, Missouri 63101

James B. Lowery, Esq.
Smith Lewis, LLP
P.O. Box 918
111 South Ninth Street, Suite 200
Columbia, Missouri 65205

Kara Valentine, Esq.
Department of Natural Resources
P.O. Box 176
1101 Riverside Drive
Jefferson City, Missouri 65102

Kurt U. Schaefer, Esq.
Lathrop & Gage, L.C.
314 East High Street
Jefferson City, Missouri 65101
kschaefer@lathropgage.com

Rebecca Wickhem House, Esq.
Foley & Lardner, LLP
777 East Wisconsin Avenue
Milwaukee, Wisconsin 53211

s/ Kevin A. Thompson_____